amateur radio

Vol. 36, No. 2
FEBRUARY
1968

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"AMATEUR RADIO"

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★

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W.I.A. OFFICIAL BROADCASTS

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53.866 Mc. a.m.	(53.950 Mc. f.m. proposed shortly)

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53.032 Mc. a.m.	

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7146 Kc.	144.36 Mc.
14.342 Mc.	

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WESTERN AUSTRALIA

VK6WI, Sundays,

TASMANIA

VK7WI, Sundays, at 1000 hrs. E.A.S.T.
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7146 Kc.	144.1 Mc.
53.032 Mc.	432.6 Mc.

W.I.A. SECURES MORSE SPEED REDUCTION

Last Easter, in Hobart at the annual Federal Convention of the W.I.A., motion 5.2 that "requirements to pass the morse code examination for the A.O.C.P. be reduced to 12 words per minute" was discussed, and eventually amended to: "**That requirements to pass the morse code examination for the A.O.C.P. be reduced.**" This left the matter up to the Federal Executive to prepare a case and negotiate with Central Office of the P.M.G's Department to secure as favourable a reduction as possible.

This was done, and in part of the submission, Executive pointed out that the minimum code speed required of Commercial operators was **ten** words per minute for the third class Commercial operator.

In the light of that, it was indicated that Executive felt it was not inconsistent to reduce the requirement for the Amateur Service to the level required by the third class Commercial operator's certificate. In addition, it was pointed out that a speed of **ten** words per minute seemed quite effective as a means of non-commercial communication.

Other points were raised in the detailed written submission and also at the conference between representatives of P.M.G. Central Office and W.I.A. Federal Executive. We are pleased to be able to release the full text of a letter recently received from the P.M.G. Department on this matter:—

Letter dated 5th January, reference 320/5/51, above the signature of Mr. R. Davies, Acting Controller, Radio Branch, addressed to Mr. J. B. Battrick, Federal Secretary, Wireless Institute of Australia.

"I refer to your letter of 24th July, 1967, and subsequent discussions concerning the question of the speed of the morse code test in the examination for the Amateur Operator's Certificate of Proficiency.

"I am pleased to be able to inform you that the Wireless Telegraphy Regulations have now been amended as required to provide for a reduction in the speed of the test from fourteen to ten words a minute.

"Accordingly the telegraphy section of the examination to be held on 20th February, 1968, and subsequent examinations will be conducted at the lower speed.

"The new conditions have been incorporated in the new Handbook which should be available shortly. [The new Handbook is now available.—Ed.]

"In the meantime, however, it would be appreciated if you would be good enough to arrange for the matter to be publicised through the normal channels of the Institute, please.

"Opportunity is taken to point out that with the reduction in the speed of the telegraphy test the marking arrangements for this section of the examination, as shown in paragraph 19 of the draft copy of the Handbook, which was forwarded to the Institute on 25th September, 1967, have also been altered. Enclosed is a copy of an extract from the revised section of the new Handbook."

An implication of this revised section 19 is that the comment published in the January issue of "A.R." on page 18 will have to be amended. Previously, with the 14 w.p.m. test of 5 minutes duration, a standard of accuracy of ten errors or less was required for a pass in the receiving section, and the $2\frac{1}{2}$ minute sending test required a standard of accuracy of five errors or less for a pass.

FEDERAL COMMENT

Now, with the test at 10 w.p.m., the receiving section will require **seven** errors or less for a pass, and the 10 w.p.m. sending section will require **four** errors or less for a pass.

Paragraph 19 summarises the pass conditions for telegraphy in a table which indicates that the receiving test is of 50 words in length, of a duration of five minutes, with the maximum number of errors permitted being seven; it also indicates that the sending test is of 25 words in length, of a duration of $2\frac{1}{2}$ minutes, with the maximum number of (uncorrected) errors permitted being four. In both tests, a "word" averages five letters, and each figure counts as two letters as was the case before.

Executive is pleased to announce a successful achievement of this motion 5.2 which was voted upon in the affirmative by all Divisions in Hobart last Easter. The negotiations were at all times conducted in a cordial atmosphere, and Executive wishes to thank the officers of Central Office P.M.G's Department who have agreed to this request from the Amateur Service as expressed through its national society, the W.I.A.

JOHN B. BATTRICK, VK3OR,
Federal Secretary, W.I.A.

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AUSTRALIS OSCAR "A"—USERS' GUIDE

BACKGROUND

THE Melbourne University Astronautical Society was formed at a time when the image of space research was dominated by a spirit of adventure. Today, much of the popular interest has subsided, but the potential of the spacecraft is being rapidly revealed. The satellite is an indispensible tool in many fields of research; its use in communications, navigation and meteorology is commonplace. The matter of communications, which received major publicity in 1962 with the success of Telstar 1, had already attracted the attention of Amateur Radio operators in the U.S.A.

At present the h.f. bands are overcrowded, but the traffic increases daily. One obvious solution is to move to higher frequencies. The early problems of noise and instability no longer haunt the v.h.f. bands, but propagation characteristics severely limit the capabilities of v.h.f. Global communications may be achieved by such methods as moonbounce, but perhaps a neater solution is the artificial satellite. This has been accomplished, but still the Amateurs are tied to the h.f. bands for international communications.

During 1965, the Melbourne University Astronautical Society began to investigate the problems of satellite construction. With the co-operation of Oscar, Project Australis was formed. Australis, like Oscar, aims to build communications satellites for use by Amateur operators in all parts of the world. In contrast to its American counterpart, Australis has no local background of satellite technology. This situation contributed to the difficulty in initiating the project. Financial limitations have also restricted progress. The result is that the first satellite is a relatively simple test vehicle, carrying two telemetry transmitters, a command system and a magnetic attitude control system. All electrical power is supplied by batteries which are expected to have an operating lifetime of about two months.

The satellite does not carry a repeater or translator.

It will be known as **Australis Oscar "A"** until it is placed in orbit around the earth. Once in orbit, it will be given the next number in the Oscar series to replace the "A".

The package construction, the command system, the antenna array and the magnetic attitude stabilisation system could all be classed as experimental. The rest of the satellite provides the platform on which the experiments may be conducted.

However, when the experimental data must be recorded at a distance, the techniques of information transmission are added variables in the system.

For Amateur operators and short wave listeners there are opportunities to practise the art of tracking satellite signals in both the ten metre and two metre bands. The behaviour of the ten metre signal will illustrate long range propagation characteristics in the band.

● This article contains full instructions for all wishing to track the satellite. Since the success of the project depends on the support of a large number of tracking stations, the organisers are anxious to enlist the co-operation of suitably equipped radio operators, short wave listeners and v.h.f. enthusiasts everywhere. Any enquiries or requests for more detailed information will also be welcomed by:

Project Australis,
Union House,
University of Melbourne,
Parkville, Vic., 3052.

In addition, there is a secondary objective. The project requires an efficient ground communications system to disseminate orbital figures and to collect data recorded by operators in all parts of the world. So far, the information channels have been organised, but the reliability of such a system has yet to be proved.

The final point illustrates the dependence of the project on human, as well as technical factors. Mechanical strength may be measured; electronic reliability has been improved with technology; for your assistance and co-operation we can only ask.

A TECHNICAL DESCRIPTION

The obvious essentials are the two transmitters (10 metres and 2 metres) carrying the eight-channel telemetry. To conserve battery power, a command system allows ground stations to control the operating time of the h.f. transmitter. A timetable will be published before the launch.

A brief technical description of the spacecraft follows.

Hi Keyer

The hi keyer generates the Morse code identification. Although it operates continuously, producing the synchronisation pulses for the telemetry encoder, its signal is transmitted for only 6½ seconds of each telemetry cycle.

Telemetry

Temperature, spin rate and battery performance are relayed to earth by the eight-channel telementry. Two temperature readings—one at the inside surface of the aluminium case, and the other from the insulated electronics compartment—are effected by thermistors.

Three phototransistors sensitive to reflected radiation from the earth are mounted on orthogonal axes. The output from each will indicate its orientation, and the rate of variation of all three is a measure of spin velocity.

The channel sequence is:—

0—Hi identification.
1—Current drain.
2—X axis horizon sensor.
3—Battery voltage.
4—Y axis horizon sensor.
5—Internal temperature.
6—Z axis horizon sensor.
7—Skin temperature.

In every case, the parameter is specified simply by the audio frequency. Unlike Oscar 1 and Oscar 2, the hi channel carries no telemetry data.

A continuously operating switch ("encoder") samples each sensor for about 6½ seconds in the 52-second cycle. The voltage output is fed to an audio oscillator which modulates both transmitters. The audio frequency may vary from 400 cycles to about 2,000 cycles.

V.h.f. Transmitter

A 50 mW. crystal controlled transmitter operates continuously on 144.050 Mc. It is amplitude modulated by the telemetry.

H.f. Transmitter

The only ground commandable equipment is the 250 mW. h.f. transmitter. It is crystal controlled on 29.450 Mc. The modulation is identical with the v.h.f. signal, except for a 180 degree phase difference. In each case the modulation index is 0.90.

Command System

Commands from earth are detected by a double change superhet receiver. The audio output is fed to the decoder which determines the validity of the command. When a correct signal is received, the decoder produces a control voltage to switch the h.f. transmitter.

Battery

Power is supplied by 28 alkaline manganese cells wired in two identical 20-volt series "strings". Each string supplies one transmitter, and the rest of the electronics run from both strings through an arrangement of protective diodes. If one string fails by short circuit or open circuit, then one transmitter is cut out, but the rest of the system operates. The diodes ensure that a short circuit in one string cannot impose an excessive load on the other.

Stabilisation

To limit signal fading, and to maintain the antennae in a favourable orientation, some form of attitude control is necessary. Spin may be introduced at ejection, or by the prolonged action during the satellite lifetime, of microscopic perturbing torques. The energy associated with spin is removed by magnetic hysteresis loss in an array of permalloy wires, and by eddy current loss in the aluminium alloy case. A bar magnet brings the X axis of the satellite into line with earth's magnetic field.

Package

The electronics modules are mounted on an aluminium frame which is built around the battery compartment. A layer of thermal insulation separates all of this from the outer case. The aluminium alloy used for the case contains 1.0% magnesium, 0.6% silicon,

0.2% copper and 0.2% chromium. A paint pattern on the outside surface is designed to maintain a fairly stable internal temperature by regulating heat radiation.

All antennae are made of flexible steel tape.

TRACKING INFORMATION FOR AUSTRALIS OSCAR "A"

Regional Directors

For the purposes of disseminating tracking information, three regional directors have been appointed. Each director is responsible for distributing information within a specified area.

When Australis Oscar "A" has been launched, Project Oscar will obtain orbital data and distribute them to the regional directors who will send them to local co-ordinators. Local co-ordinators will complete the distribution to all tracking stations within their area.

Areas and Regional Directors

North and South America: Project Oscar Inc., Foothill College, Los Altos Hills, Calif., U.S.A., 94022.

Asia and Australasia: Project Australis, Union House, University of Melbourne, Parkville, Vic., Aust., 3052.

Europe and Africa: W. Browning, G2AOX, 47 Brampton Gr., Hendon, London, N.W.4, U.K.

Data Distribution within Asia and Australasia.—The local co-ordinators within the Asian and Australasian area act as links between the regional director and amateurs who are tracking Australis Oscar "A". The co-ordinator will have the following responsibilities:

(a) He will have equipment to provide two-way h.f. communication with the regional director for the reception of tracking information and the transmission of urgent data about the satellite condition.

(b) He will distribute orbital predictions to amateurs within his area.

(c) He will provide telemetry forms to tracking stations and return completed forms to: Project Australis (Telemetry), Union House, University of Melbourne, Parkville, Vic., Aust., 3052.

(d) He will keep up-to-date information on the operation of Australis Oscar "A" and will be able to provide this information to tracking stations and the press.

(e) He will ensure the best possible press coverage, as present and future Oscar projects rely upon public support. All information within this Users' Guide may be released to the press.

Local Co-ordinators

Local co-ordinators for the Asian and Australasian area are as follows:

New South Wales: A. Swinton, VK-2AAK, P.O. Box 1, Kulnura, N.S.W., 2251.

Victoria: W. M. Rice, VK3ABP, 54 Maidstone St., Altona, Vic., 3018.

Queensland: L. Blagborough, VK-4ZGL, 54 Bishop St., St. Lucia, Qld., 4067.

South Australia: B. Tideman, VK-5TN, 33 Ningana Ave., Kingspark, S.A., 5034.

Western Australia: D. Graham, VK-6HK, 42 Purdon St., Wembley, W.A., 6019.

Tasmania: P. Frith, VK7PF, 181 Punchbowl Rd., Launceston, Tas., 7250.

Japan: Kenso Sano, JA1EC, 11-16 Misaki-2, Kofu, Japan.

Malaysia: C. W. C. Richards, 9M2CR, Telecommunications Training Centre, Jalan Gurney, Kuala Lumpur, Malaysia.

New Zealand: B. Rowlings, ZL1WB, Mason St., Onerahi, Whangerei, Northland, New Zealand.

Orbital Data and Predictions

In order to obtain good v.h.f. telemetry records from Australis Oscar "A", it will be necessary to use moderately directive receiving antennae which must be pointed towards the satellite throughout the pass. This section describes the tracking data to be distributed by Project Australis and explains how to use it.

Using the Orbital Predictions.—Throughout this section it is assumed that the satellite is in a circular orbit at a height of 500 statute miles, and with an inclination of 70 degrees to the equator.

Once the height and inclination of the orbit are known, the position of the satellite during a particular pass can be specified by the time and longitude of the previous northbound equator crossing of the satellite. The times and longitude of these northbound equator crossings will be predicted by Project Oscar and distributed to local co-ordinators. A typical set of northbound equator crossings is given in Table 1.

Ascending Nodes for Australis Oscar "A"

Date	Orbit	Time	West Longitude
31 Jan. '66	0000	0526	356
31 Jan. '66	0001	0707	20
31 Jan. '66	0002	0848	44 ***
31 Jan. '66	0003	1029	70
31 Jan. '66	0004	1210	96

Table 1.

Each local co-ordinator will be provided with a set of standard antenna pointing angles, giving at two-minute intervals, the satellite azimuth and elevation angles and the number of minutes since the previous northbound equator crossing. These pointing angles will be supplied for a number of standard longitudes of the northbound equator crossing. A set of pointing angles for a standard pass is shown in Table 2.

To obtain antenna pointing angles for a particular pass, choose the standard set which has a northbound equator crossing as close as possible to the actual longitude of the northbound equator crossing for the pass. This actual longitude will be given in the orbital predictions, such as those in Table 1. Add the number of minutes given in the left-hand column of the set of standard pointing angles (Table 2) to the time of the northbound equator crossing for the actual pass (given in the predictions, such as in Table 1), obtaining the time for which the satellite is at the given azimuth and elevation angles.

Standard Orbit Cordinates

For Station VK3ATM, Melb'ne, Aust. 215° West, 37° South.

Ascending Node, 45° West.

Add Minutes	Azimuth	Elevation
84	171	3
86	165	9
88	159	15
90	144	19
92	131	15
94	123	10
96	119	5

Table 2.

This is a sample computer output.

For example, if orbit number 0002 of Table 1 is to be tracked at Melbourne, first obtain the longitude of the northbound equator crossing from Table 1 (44W.). Then choose the closest standard orbit, for which the longitude of the northbound equator crossing is 45W. (shown in Table 2). To give the actual time, add the equator crossing time to each time in the left hand column of Table 2. Thus at 0848 GMT + 84 minutes = 1012 GMT the satellite azimuth will be 171 deg. and elevation will be 3 deg. The azimuth and elevation angles are similarly calculated every two minutes, giving the pointing angles shown in Table 3.

Calculated Pointing Angles for Orbit Number 0002

Time GMT	Azimuth Deg.	Elevat'n Deg.
0848 + 84 = 1012	171	3
+ 86 = 1014	165	9
+ 88 = 1016	159	15
+ 90 = 1018	144	19
+ 92 = 1020	131	15
+ 94 = 1022	123	10
+ 96 = 1024	119	5

Table 3.

As a rule, tracking stations will be able to observe two northbound passes about 100 minutes apart, followed about 12 hours later by two south-bound passes about 100 minutes apart. This pattern will be repeated each day.

Schedules.—As a rough guide, the equator crossing predictions are accurate for as long after issue as the satellite has been in orbit when the predictions are issued. For example, predictions issued three weeks after launch will be accurate for about another three weeks.

Each local co-ordinator will receive tables of Standard Pointing Angles and Northbound Equator Crossings as described below.

(a) Several months before launch, a set of Standard Pointing Angles for the expected orbit, and a set of typical Northbound Equator Crossings (for demonstration purposes only) will be issued.

(b) As soon as possible after the launch, a list of Northbound Equator Crossings will be issued. This list will probably be accurate for only a few days. If the actual orbit is greatly different from that expected, a new table of Standard Pointing Angles will be issued.

(c) Throughout the satellite lifetime, lists of Northbound Equator Crossings will be issued by both mail and Amateur Radio, sufficiently often to keep local co-ordinators well informed, probably at fortnightly intervals.

USING AUSTRALIS OSCAR "A"

Australis Oscar "A" will transmit telemetry continuously at a frequency of 144.050 Mc., and at a frequency of 29.450 Mc., when the transmitter has been commanded on.

All tracking stations are requested to obtain telemetry data from either transmitter whenever possible, since telemetry reception and reduction is one of the major purposes of this project.

The following sections give an outline of the minimum equipment needed to receive telemetry from Australis Oscar "A".

Receiving Antennae

V.h.f. Antenna.—It is desirable to use a circularly polarised receiving antenna to reduce fading caused by changes in satellite attitude. This antenna should have a gain of at least 10 db.

One suitable antenna is a crossed yagi (two yagi antennae pointing in the same direction, one with vertical and the other with horizontal polarisation), one being connected through an extra quarter wavelength of cable, giving a 90-degree phase shift between the two driven elements. Another suitable antenna is a helix, such as the one described in "QST" for November, 1965.

To receive good signals while the satellite is at high elevations the antenna should be steerable in elevation as well as in azimuth.

If measurements of the satellite spin rate are to be made, a horizontally or vertically polarised antenna should be used.

H.f. Antenna.—If a linearly polarised antenna is used to receive the h.f. signal, fading will occur because of both satellite spin, and ionospheric Faraday rotation. Thus it may be difficult to determine the satellite spin using the h.f. signal, unless the operator is capable of separating the two variations.

For reception of the h.f. telemetry, a pair of crossed, horizontal dipoles, mounted one quarter wavelength above ground, will give a reasonably good omni-directional, circularly polarised pattern.

Converters

To obtain a good signal to noise ratio, the v.h.f. converter should have a noise figure of about 4 to 8 db. Most h.f. receivers should be adequate to receive the h.f. telemetry although some older receivers may need a pre-amplifier.

Receivers

Both transmitters are amplitude modulated, with maximum modulation frequencies of 2,000 cycles, so that receivers should have i.f. bandwidth of about 4,000 cycles. Except for initial acquisition of the signal, a b.f.o. should not be used, as the telemetry information will be lost.

Telemetry

Most of the information required about the satellite is derived from the audio telemetry, which has eight sequential channels. Each channel is transmitted for about 6½ seconds and the whole cycle lasts for 52 seconds.

The hi channel consists of a 1.6 sec. tone followed by a 1.6 sec. hi, all repeated once again. The hi is transmitted not as m.c.w. but as a.f.s.k. Thus the tones do not key on and off, but switch between two tones of different frequency. The actual frequencies contain no telemetry information.

The hi channel is followed by seven tones, each 6½ sec. long and each sending information about one of the channels. By measuring the audio frequency and using the calibration graph for the channel, the quantity concerned can be determined. During telemetry decoding, the time should be watched carefully, as the frequencies of two adjacent channels may be similar and the transition from one to the next may not be audible.

The sequence of the telemetry channels have been previously mentioned.

To enable the telemetry reports to be evaluated by computer, all tracking stations are requested to enter their observations on a special telemetry coding form.

Telemetry Decoding

One convenient method for decoding the telemetry is to use Lissajous figures. The received audio signal is applied to the vertical input of an oscilloscope and a sine wave from a calibrated audio oscillator is applied to the horizontal input. The frequency of the audio oscillator is adjusted until a stationary ellipse is seen, indicating that both frequencies are the same.

If the oscilloscope timebase has been calibrated, a set number of cycles can be displayed and the period of each cycle determined, and hence the frequency. If the timebase is free-running, as little sync. as possible should be used to avoid changing the timebase calibration.

If an oscilloscope is not available, the frequencies of the received telemetry and of the audio oscillator can be matched by ear. Even with poor signal to noise ratios, this method give results accurate to within about 10 cycles at 2,000 cycles.

Another method, which in many cases can give better accuracy than any previously described, is to match the tone with a piano note. However, confusion of octaves must be carefully avoided.

Lastly, if the signal to noise ratio is good, the best method is to use a direct-reading frequency meter or digital counter.

If a tape recorder is used to record data, its speed should be accurate to within five per cent., at worst, or else results will be seriously in error. Otherwise, operators are advised to practise measuring the frequency of an audio tone in less than seven seconds. It should be pointed out that inaccurate results are worse than none at all—an accuracy of at least ten per cent. is needed.

Readability and Signal Strength

The readability and strength of the received signal will be used in deciding the weight given to the decoded telemetry.

Telemetry Coding Form

Having decoded the telemetry for a pass, please select those results which you think are the most reliable. This will often mean rejecting wildly inconsistent results which may arise when the telemetry is decoded directly, rather than from a recording. Where a large number of consistent results are obtained, all should be entered on the telemetry coding form, since this is an ideal indication of the reliability of the information.

Please write clearly, with only one character in each column. All dates and times must be in GMT.

The following information is required:—

(a) Call sign of tracking station. (If no call sign, write ZZ1, followed by the operator's initials.)
(b) Orbit number.
(c) Month and day.
(d) Time of acquisition of signal (A.O.S.) and loss of signal (L.O.S.), and readability and strength for each transmitter.
(e) Hi keyer operation: the letter A for normal and F for failure, which should be described on a separate sheet.
(f) Battery current drain in milliamp.
(g) Battery voltage in volts.
(h) Internal temperature in degrees Centigrade.
(i) Skin temperature in degrees C.

All data entered on these sheets will be stored in a computer at Melbourne University. The form is in fact a replica of a computer card.

Reports on horizon sensor data should be treated differently. Since we are concerned only with eight "light" or "dark", the actual frequency of the sound is of no interest. Each change in frequency corresponds to a transition of the field of view of a sensor between different states of illumination. The length of the higher frequency (bright) periods, depends on the spin rate, and on the nature of the traverse across the bright source. For example, a short period could correspond to a single sweep across a short chord, or to a much faster sweep across a near diameter of the earth's disc. The sun and moon will also appear as bright sources against the dark background of space. However, they subtend such small solid angles at the satellite that the sensors will rarely sweep across them. Both would produce short high-pitched signals in the appropriate telemetry channels (Nos. 2, 4 or 6).

Now because the package may be rotating about three axis simultaneously, the spin rate on any single channel may not sound regular, except over a very long time. It is impossible to determine the spin rate directly. In fact

(Continued on Page 12)

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THE SHOEBOX II. LINEAR*

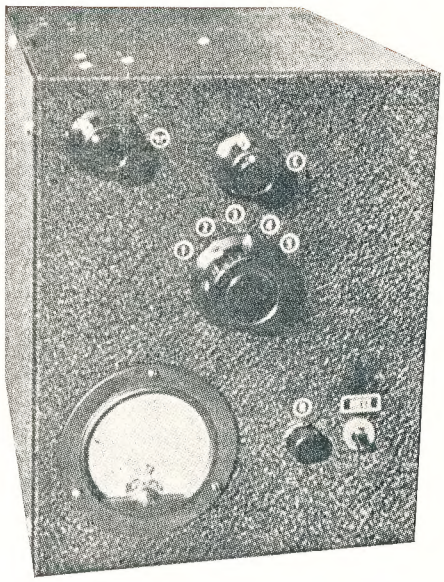
JOHN J. SCHULTZ, W2EEY/1

THE original Shoebox Linear appeared in an earlier issue of "CQ". Basically, it was designed as an easy-to-build project using only hand tools. The original linear used rather old-fashioned 837 tubes which the "CQ" staff suggested changing to 12DQ7 tubes. After hearing from various Amateurs who built a linear along the Shoebox lines, I decided to build another one incorporating some of their suggestions and some ideas of my own to improve the unit. The resulting Shoebox II. is even easier to build than the original, uses modern low-cost tubes, lower plate voltage, has variable output loading and offers several drive and power level options to suit almost anyone's needs.

The unit uses 6HF5 tubes which have become probably the most popular t.v.-gone-linear tube judging from its wide use in home-brew and commercial designs. With 800 volts plate voltage, the recommended maximum, each tube can handle about 200 watts p.e.p. or 150 watts c.w. input. The linear can be built with anywhere from 1 to 10 of these tubes in parallel, depending upon the power level desired. This wide range of tube quantities can be accommodated with relatively minor changes in the basic design.

The power transformer must be capable of supplying the filament power of 6.3 volts at 2.25 amperes per tube and a high-voltage winding VA rating (taking the total secondary voltage) of about 50 watts per tube (60 mA. for an 800 volt secondary). The p.i.v. rating of the diodes in the bridge rectifier remains the same and diodes of various current ratings differ very little in price. The size of the filter capacitors remain the same. This would not be the case if a doubler circuit were being used as with the original Shoebox since the capacitor size would then have to be increased with increased current drain. The other components that must be chosen for the number of tubes used are the plate choke (current rating) and the pi-network coil.

* Reprinted from "CQ," July 1967.



Front view of the Shoebox II. Linear. Although similar in concept to the earlier Shoebox Linear, the Mark II. features more flexibility of operation and ease of construction. Inexpensive 6HF5 tubes are used in parallel to deliver as much power as the builder desires.

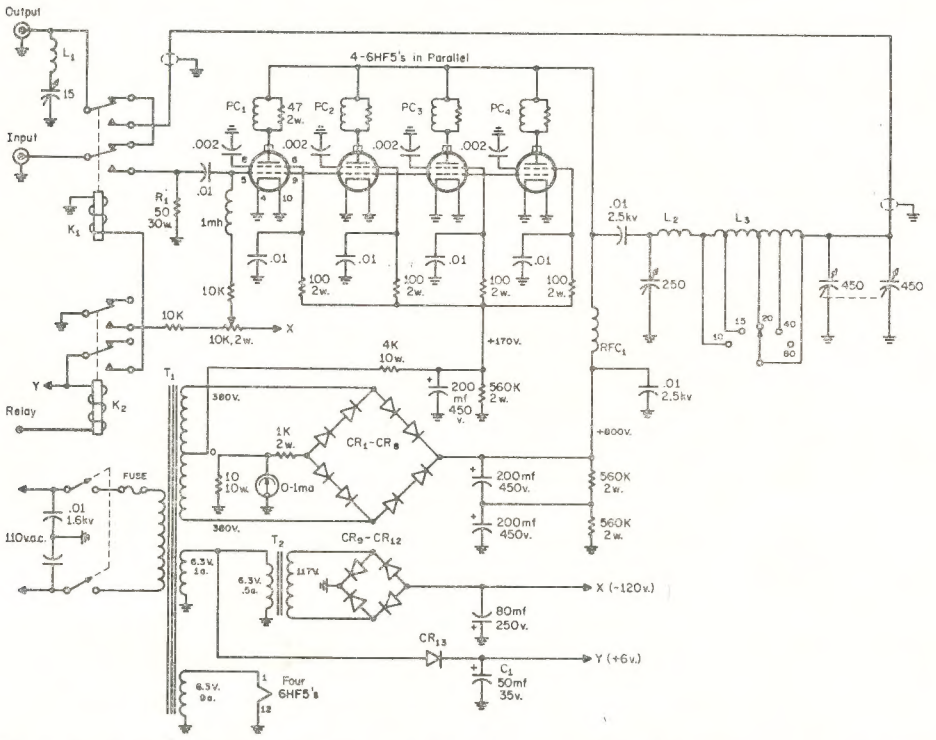


Fig. 1.—Circuit of the Shoebox Linear II. using four tubes in parallel. All resistors are ½ watt except where noted. All capacitors greater than one are in pF.; capacitors less than one are in uF. except where noted. Control grids of each tube are paralleled directly with heavy wire or ¼ inch flat copper strip. Relays K1 and K2 can be a.c. types and CR13 and C1 eliminated. If d.c. types are used, however, the relay operation is quieter.

CR1 to CR8—750 mA., 800 p.i.v. diodes.
CR9 to CR12—200 mA., 400 p.i.v. diodes.
CR13—1 amp, 100 p.i.v.
K1, K2—D.p.d.t. relay 6v. a.c. or d.c. coil, or one 4 p.d.t. relay (see text).
L1—7t. 16 g. enamel, ½ in. diam., spaced 1/16 inch between turns for Channel 2. Reduce the number of turns for higher channels.
L2—4t. 8 g. tinned, 1 inch diam., 1 inch long.
L3—36t. 14 g. tinned, 2 inch diam., 8 t.p.i., 4½ inch long. Polycoil No. 1770 or Air Dux No. 1608T. 15 mx tapped at 2t., 20 mx tapped at 4t., 40 mx tapped at 7t.
PC1—10t 18 g. enamel, closewound on 47 ohm 1 watt composition resistor.
RFC1—1 mH., 600 mA. National R154U or equiv.
T1—TV type power transformer, 380-0-380v. a.c. at 250 mA., 6v. at 9a., 6v. at 1a.
T2—Filament transformer, 6v. a.c. at ½ amp. connected backwards.

LINEAR CIRCUIT

Fig. 1 shows the schematic of the linear using four tubes as constructed by the author. A grounded cathode circuit is used and the grid input circuit can either be untuned or tuned. Most s.s.b. exciters will supply sufficient drive so an untuned input circuit can be used. Approximately 10 watts of drive per tube is required. The untuned circuit is preferred not only because it eliminates a tuning control but because of increased amplifier stability. The load resistor used in the grid circuit must be an r.f. non-inductive type. (It should **not** be a wire-wound power resistor labelled "non-inductive".) A suitable 50 ohm 30 watt unit can be constructed from 2 watt composition resistors as shown in the photograph.

If an exciter unit is used which will not supply sufficient drive for an untuned input circuit (such as a 10A or 20A unit) the tuned input circuit shown in Fig. 2 can be used. Only a watt or two of r.f. will be required for drive. However, care must be taken to properly isolate the input and output circuits. The input circuit should be enclosed in a Minibox inside the main enclosure. A neutralisation voltage tap is available from the multi-band circuit shown in Fig. 2. Normally, it should not be needed but, if it is, a metal tab of ½" x 3" placed near the plates of the tubes should suffice.

The pi-network coil shown in Fig. 1 should be adequate for five or possibly six tubes. However, beyond this, the output capacity of the tubes adds up to such a value that on 10 and 15 metres a coil of the required low inductance becomes touchy to build. Placing a variable capacitor in series with a larger inductance, as shown in Fig. 3 (as is done in the Galaxy linear which uses ten 6HF5s) solves this problem nicely although care must be taken to isolate

the capacitor from the chassis by mounting it on standoffs or on a small piece of plexiglass.

BIASING

Sufficient bias voltage is provided so the tubes can be biased to cut-off during standby periods. Such a provision not only contributes to keeping the heat down within the enclosure, but also prevents tube noise from possibly causing difficulty during reception periods. The bias adjustment control is brought out as a front panel control to facilitate experimental adjustments but actually it can be left as a rear panel or internal control since it seldom requires adjustment unless the line voltage varies more than 10 per cent.

The relay switching circuit is shown using two relays only because the author did not have a suitable t.p.d.t. relay available.

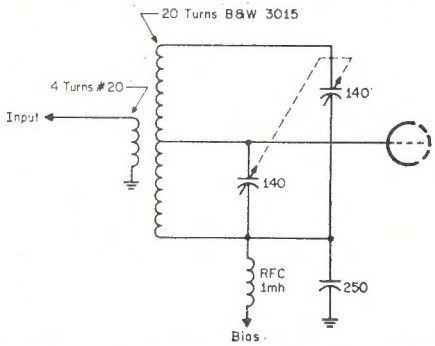


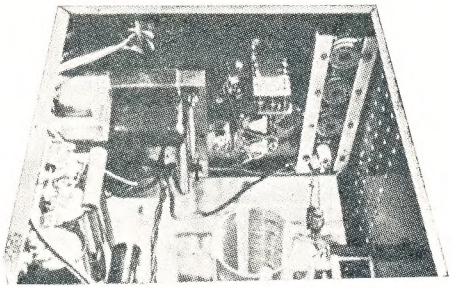
Fig. 2.—Circuit of an 80-10 metre multiband tuned input circuit which can be used to replace the 50 ohm 30 watt untuned input resistor shown in Fig. 1. The input coil is wound over the centre of the centre tapped secondary.

T.V.I.

To reduce or eliminate t.v.i. a series tuned resonant trap can be placed across the output circuit as shown in Fig. 1. It can, of course, be omitted if there is no t.v.i. problem. In areas where the problem exists, the tuned circuit will be found most useful since most linears for some reason concentrate their t.v.i. in one channel.

METERING

The meter in the negative lead of the high-voltage bridge circuit measures total cathode current Although a 0-1 milliammeter is shown in Fig. 1, a less expensive 0-1 ampere meter could just as well be connected from the negative point to ground directly and eliminate the need for the 10 and 1,000 ohm resistors shown in the meter circuit. The meter is used to check the broad resonance of the output circuit and that the bias voltage is set correctly.



Interior view of the Shoebox II. gives some idea of the simple construction. At the left, foreground, is the power supply section, with most components mounted between two 12-terminal strips.

Final tuning of the output circuit is best done with a meter indicating relative power output but since most Amateurs have this feature available in s.w.r. bridges, no means to do this was provided within the linear.

CONSTRUCTION

The construction of the linear follows that of the original Shoebox, utilising a 8" x 10" x 10" steel, metal utility cabinet. All of the components are mounted on the four joined sides of the cabinet. No components are mounted on the removable sides of the cabinet to facilitate construction and to allow complete access to the circuits for adjustment or repair. Since component sizes will vary, it is suggested that all components be carefully laid out against each side before any holes are drilled.

The large holes necessary for the meter and transformer mounting are easily cut out with a nibbling tool, a handy and inexpensive tool to have around any shack for cutting out any form of chassis holes.

The size of transformer used by the author for four tubes permitted mounting of the laminated portion inside the enclosure. With a larger transformer it may be necessary to mount this portion on the outside of the enclosure. Also, if more than five tubes are used without going to a larger enclosure, it probably will be necessary to re-locate the antenna switching relay. Unfortunately, the only alternative location would seem to be on one of the removable sides.

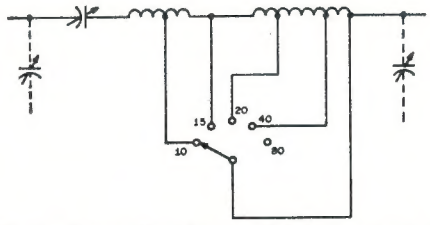


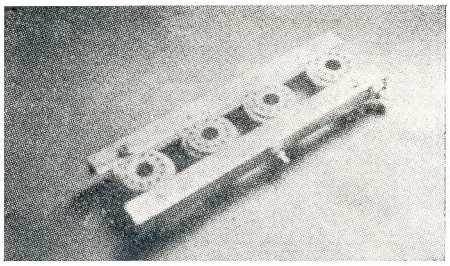
Fig. 3.—If more than five or six tubes are used in the linear the normal pi-network coil used in Fig. 1 will have to be replaced by that shown above. Some experimentation is necessary to find the best tap positions, depending upon the number of tubes used. The series capacitor should be approximately 500 pF. for ten 6HF5 tubes.

The mounting of the tube sockets is done very simply on ½" aluminium angle stock as shown in the photograph. It is very desirable that compactron sockets with a metal grounding ring be used in order to insure a good ground path between the two aluminium angle mountings. The moulded sockets commonly available do not provide this feature as well as having no ground connection tabs.

There is nothing extremely critical about the tube circuit wiring except that the grid leads be kept as short as possible and that the by-pass capacitors be connected from the socket pin to the nearest ground tab on the socket. As shown in the photograph, two feedthrough insulators are used; the one in the centre for the grid circuit r.f. input and the one at the end for the filament lead since the heavy 9 ampere lead from the power transformer is too heavy to be connected to a socket pin. The hook-up wires for the bias and screen voltages are wired directly to the appropriate socket pins. The 100 ohm screen parasitic suppressors and the r.f.c. in the grid bias circuit are connected between socket pins utilising the No. 2 and 7 unused pins.

POWER SUPPLY

The power supply components are all mounted between two 12-unit terminal strips. The exact terminals used will depend upon the size and type of components used but they all should fit easily on the two-terminal strips. A sketch to plan the wiring will quickly indicate which terminals to use. No equalising resistors or capacitor voltage spike suppressors are used across the power supply diodes as suggested in the original Shoebox article. The cost of such components usually exceeds that of the diodes they protect and commercial designs use 7 to 8 diodes in series without any difficulty. However, if desired 0.01/1 kv. disc capacitors and 560K 1 watt resistors can be connected across each diode.



Four Compactron sockets are mounted together between to sections of ½ x ½ inch aluminium angle stock. Feedthrough insulating studs supply filament and screen voltage to the assembly. Sockets are pre-wired before installation.

WIRING

The wiring of the complete linear is extremely simple. The power supply terminal strips and the tube sockets are pre-wired. The relay and pi-network circuit components are mounted and wired in place. The power supply components (transformer and pre-wired terminal strips) are then mounted and wired to include the front panel controls. Finally, the tube socket mounting is installed and the remaining interwiring completed.

TESTING

Testing of the linear should proceed by first disconnecting the filament lead from the tube socket mounting and with the power turned on checking that all voltages from the power supply are correct. With the tube filaments energised, but with no drive applied, the bias potentiometer is adjusted to produce a cathode current of approximately 25 to 30 mA. per tube (about 100 mA. for four tubes). If this value cannot be obtained, one of the power supply voltages is incorrect and should be corrected before proceeding further.

Still without drive, the plate and loading variable capacitors should be turned through their entire range for

(Continued on Page 9)

A MOBILE POWER SUPPLY

Incorporating a Handy Stationary Parked Adaptor

DOUG. J. PANNELL, VK6EP (VK6SP MOBILE)*

RECENTLY I went walk-about (civilised-style) complete with a caravan. Maybe it wasn't that peaceful either, I had the XYL and two harmonics along as well. Anyway I was mobile around central Western Australia and the Swan is a powerful bird to build a mobile supply for **cheap**. Several low power S.S.Switchers purred along nicely for me if I didn't load them.

Up came a suggestion from VK6XY that he remembered a W commenting on the possibility of using the alternator some modern mobile shacks have for standard equipment. Now this is a bit much, breaking into a nicely sealed JA type three-phase alternator. I found all hands and the XYL out one Saturday afternoon, so into it I went. I had to remove it completely and open it up to get at the point of take off before the diodes.

Beware of the two slip-ring brushes, take the precaution of lifting them. Eventually I got the unit back in its appointed place and there were three 40/007 shielded leads coming from a bushed hole in the casing. I started the prime mover, and proceeded to find the voltage flow, E E E and it was 10 volts come idle or flatout. Now here was a point to start, and start I must, because events at the top of this page are two months old. Time had fled, leave was around the corner.

The months had dwindled to two weeks and no mobile supply was in evidence, so, to the grindstone. First I ordered 3 lb. of e.c. 16 s.w.g. to carry the 10a. maximum alternator output.

* 20 Hare Street, Kalgoorlie, W.A., 6430.

Next I sorted my core stocks and found enough for three cores of 50 watt capacity at 50 c.p.s. (N.B.).

Put all this information on the shelf because here I learned about a rummage disposal of superceded equipment by an organisation to take place the following Saturday. I brought away three ancient transformers manufactured by an amalgamated group pre-war, 3½" square by 4" high, labelled 410v. 40 cyc. 10v. 1 5a. along with other bits. On brushing the dust off, **horror**, there appeared a point (.) between the 1 and 5 rating!!!

Here my school changes the 10v. winding becomes the primary and the 410v. the secondary! Obviously we must check the capacity of this 10v. winding, so I placed an ammeter across the 10v. primary and loaded the 410v. secondary through a Variac until 9 amps. showed on the meter. Half an hour later I casually tested the case temperature with the tip of a finger. It was barely warm!!! Hastily I switched off the power lest any harm should befall these valuable pieces of equipment. They had been subjected to much more than ever to be encountered in actual use.

A chassis, a piece of 12g. 3½" cad. channel, 11" long, was located in the junk box and the three transformers bolted to it. These have terminal posts set in each base so point to point wiring aided by two 3" strips either side of the centre were all that was required.

The alternator is connected in Star "Y" and the star point floats so I brought out the three phases, fused them at 20 amps. and terminated them in a plug-base.

Now the three primaries I connected in Delta and wired a plug-top on the three incoming leads. The secondaries are wired in Star, all as shown in the diagram, and h.t., med. h.t., bias, and ground all terminate in a four-pin Jones plug-base.

My unit is mounted on the bulkhead up front alongside the radiator, and the four power leads run in shielded cable to the 350. There is a relay operated by the on-off switch mounted on the power unit which opens two phases as well as cutting the heaters when not required.

Watch your soldering! as this unit comes in for its share of vibration and you could lose a badly soldered joint. Know what happens when your bias open circuits? I do!!!

The reason for the three-pin plug, besides access, is to enable the alternator to be unplugged when stationary operation for long periods adjacent to mains occurs. Now T4 (a 300 watt Star secondary transformer) can be substituted for the alternator and save long idling operation.

The voltage stability requires comment. After switching the heaters on and allowing a brief warm-up, as soon as cranking commences, up runs the signal meter and the receiver comes to life even before the engine fires. Measurements made indicate stability at 10 volts from cranking speeds to full engine revs., the efficiency increases as revs. go up and if poor iron is used, so will heat, so watch your selection. Don't build one for a turns iron ratio at above 50 cycles. I yak a lot at idling speed and I like the convenience of my SP adaptor.

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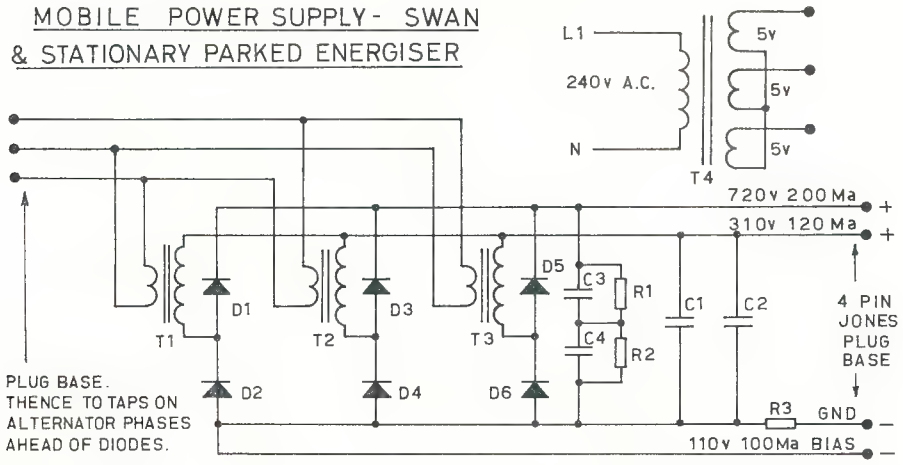

C1-C4—32 uF. 600 v.w.
D1-D6—BY100.
R1-R2—20K 1w.
R3—1K 40w.
T1-T3—10-410v. at **50 cycles.**
T4—240-10v. Star at **50 cycles.**

T1-T3 Data for 50 cycles, as text.
50va. cores: 1 sq. inch c.s. area. 1 sq. inch cross sec. area: 7 t.p.v.
Prim. I: 10a. on peak, 16 s.w.g. x 70 turns.
Sec. I: 60 mA. peak, 33 s.w.g. x 3000 turns inc. 5%.

T4 Data—
400 v.a. core: 3.5 sq. ins. at 50 cycles for 2.33 turns/volt.
Prim. I: 1a. on peaks, say 25 s.w.g. x 560 turns.
Sec. I: 10a. on peaks, so two 16 s.w.g. wires x 12 turns for each of three (pseudo star) 5v. windings connected as shown.

THE SHOEBOX II. LINEAR

(Continued from Page 8)

each setting of the bandswitch to check for parasitics by noting any change in cathode current. If any are noted, the plate parasitic suppressor coil should be adjusted until they disappear.

With drive applied (c.w.), a cathode current of about 175-200 mA. per tube (approximately 750 mA. for four tubes) should be obtained with the output circuit resonated. The cathode current meter swing with s.s.b. modulation depends upon the meter movement characteristics, but will be about 100 mA. per tube. The allowable meter swing for maximum output without distortion can only be checked properly by a two-tone test or careful on-the-air check using a receiver with a panoramic adapter.

Thanks are certainly in order for those who wrote about the original Shoebox article. Hopefully, this article has further clarified some of the construction procedures used and by use of improved design made the linear more appealing as a relatively simple construction project.

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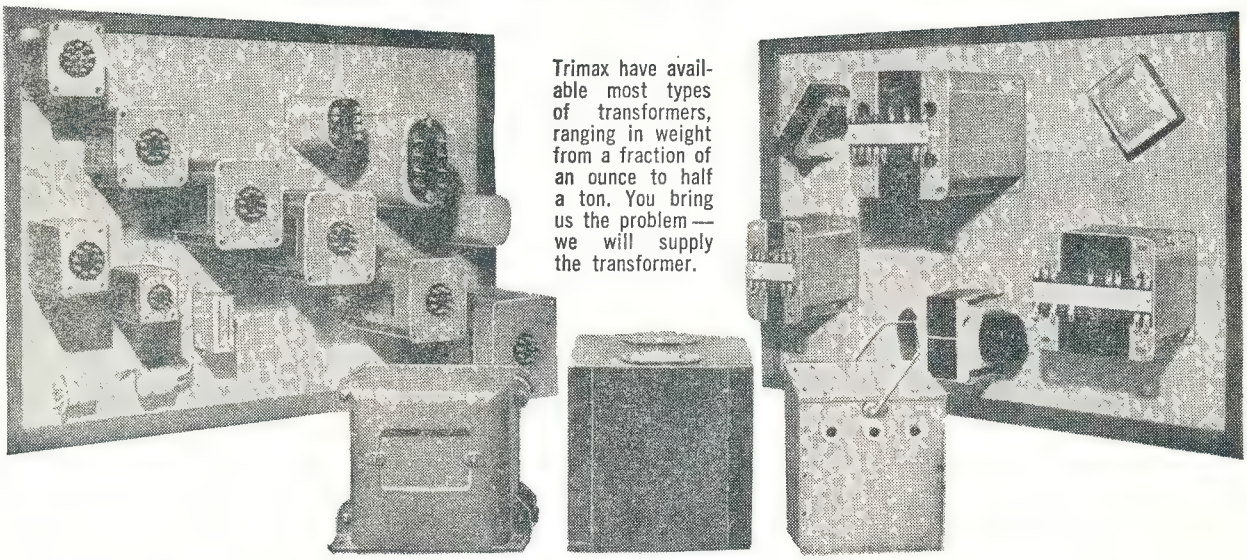

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LM 51

The Stability of Transistor Variable Frequency Oscillators*

A. D. MacDONALD, B.Sc., Assoc.I.E.E.

TRANSISTORISED v.f.o's are still generally considered to be less stable than valved ones, and considering some designs, there is justification in this belief. However, transistors can perform well, and it is the purpose of this article to decide how to go about achieving the highest possible stability without introducing too many complications.

There are three causes of instability: (1) Supply variations, (2) Temperature effects, and (3) Loading effects.

SUPPLY FLUCTATIONS

A change in the supply voltage to a transistorised oscillator results in a change in the base to collector capacitance, which affects the total capacitance across the tuned circuit, and so the frequency alters. As this change of capacitance can easily be 0.5 pF. for a voltage change of 9 to 8 volts, the effect of it makes it practically essential to use a stabilised supply, and a Zener diode stabiliser is usually sufficient.

TEMPERATURE

Temperature effects are many and varied. First consider the transistor. An increase in temperature increases the gain, reduces the base to emitter voltage drop, and results in a greater current flow.

This in turn alters the parameters of the transistor, and once more appears as a change of capacity across the tuned circuit. The cure? If the stability of the operating point is improved, the frequency stability of the operating point is improved, the frequency stability will likewise improve, and this necessitates the use of low resistance bias potential dividers, and possibly a compensating diode, as shown in Fig. 1. The diode should have the same voltage drop as the transistor base to emitter voltage. The effect of temperature on a germanium transistor is, incidentally, likely to be less than silicon in a good design.

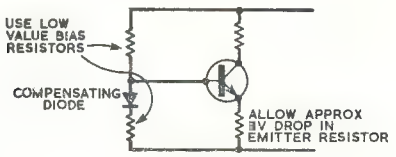

Fig. 1.—Use of a diode to compensate for variations in ambient temperature.

What about the tuned circuit components themselves?

Considering coil formers first, the temperature coefficient of all plastics is large, and thermoplastics like polystyrene are particularly high. Bakelite is better, and will probably be favoured owing to its availability. However, ceramic formers are vastly superior and it is worth seeking the smaller types.

The list of temperature coefficients (Table 1) includes pyrex for a good reason. As it is so stable, it makes an excellent coil former, and is available in the form of a pyrex test tube, easily cut to the right length.

Whatever former is used, it is important that the coil is wound tightly on it, for otherwise sudden small movements can occur. Actually all sorts of problems arise, because the wire has a different coefficient of expansion from the former, but if a strong glue is used, and the wire is thin, the former should be the controlling factor.

Polystyrene	80 p.p.m.
Bakelite	25 p.p.m.
Glass	9 p.p.m.
Ceramic	3 p.p.m.
Pyrex	1 p.p.m.

Table 1.—Coefficients of Expansion.

Do not use wave or pile-wound coils, which are not likely to be stable, and mount the coil well clear of any metal, as the metal can easily move with temperature. Finally, under no circumstances should magnetic core materials be used.

For a well constructed coil, the temperature coefficient of the inductor should be about the same as the coefficient of expansion of the former material.

Next we attend to the capacitors. Normally the variable part of the total capacitance is small, so the temperature coefficient is not too important, but make sure that the capacitor has bearings at both the front and the back, so that its capacity will not vary with the pressure of the hand on the tuning knob.

For the fixed capacitors, mica is usually the most stable, polystyrene has a negative coefficient, and ceramic can be obtained with a wide range of coefficients.

Mica	+35 p.p.m.
Polystyrene ..	—130 p.p.m.
Ceramic	+100 to —750 p.p.m.

Table 2.—Temperature Coefficients of Capacitors.

The choice is not easy to make. Certainly most of the capacity should be mica, with some negative coefficient added to balance, but ceramic capacitors are sometimes prone to humidity troubles, and polystyrene capacitors are readily available though in fewer values. On balance, cermaic capacitors of —750 p.p.m. coefficient are probably the best to use for compensation, but only a few per cent. of the total capacity should be of this type. The old idea of fixed value, variable coefficient capacitors was very useful under these circumstances, but such components are not so easily come by now.

One more point which affects stability is the by-pass or d.c. blocking capacitor usually associated with the oscillator coil. This is effectively in series with the tuning capacitors, as in Fig. 2.

The types of capacitor usually used in these by-pass positions have a high temperature coefficient, maybe 1,000 p.p.m., so in a quite typical circuit where the tuning capacitances add up to 2,000 pF., the by-pass capacitor is 0.1 uF., or 2 per cent. of the total. Thus this capacitor adds 20 p.p.m. to the co-efficient, and the choice should be restricted to a low coefficient type, or a much larger value, for instance 1 uF. If 20 p.p.m. sounds small, remember that for a 10°C. change, a 14 Mc. signal changes by 2.8 Kc.

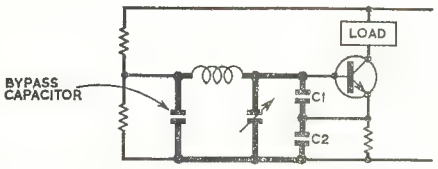

Fig. 2.—A typical transistor oscillator with the by-pass capacitor discussed in the text.

INFLUENCE OF THE OUTPUT LOAD

So much for components, what about varying load? Because of the internal feedback from collector to base, changes in the load caused by tuning or keying later stages will result in an apparent change in the oscillator tuning capacitance, producing frequency shift.

The easiest way of reducing loading effects is to operate the oscillator at a sub-harmonic of the desired frequency, as much of the feedback will then be at the wrong frequency to have much effect. Even better is to have two oscillators and mix their outputs to get the required frequency, as the feedback is then not even harmonically related. However, a small degree of frequency shift can still occur.

As the feedback appears as a change of impedance, the resistive part is relatively unimportant to the tuned circuit, but the reactive part is the main concern. By making the capacitors C1 and C2 in Fig. 2 large, they tend to swamp the changes fed back to the base. The only other thing to do is to use a circuit configuration which allows very little feedback. The three possible configurations are shown in Fig. 3.

Fig. 3(a) is considered by many to be poor, as common emitter stages are known to have poor isolation. How-

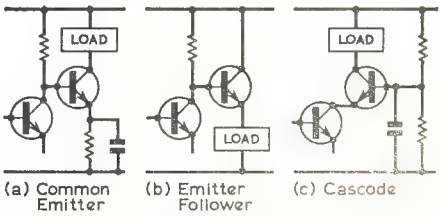

Fig. 3.—Transistor configurations considered for isolation of the tuned circuit from the output connection.

* Reprinted from R.S.G.B. Bulletin, Sept. 1967.

ever, because of mismatch, this gives a very much better performance than is often anticipated.

In Fig. 3(b), alterations in the load are directly reflected by the emitter follower, so the configuration should not be used. Remember that the input impedance of an emitter follower is β times the load.

It is becoming fashionable to use transistor cascodes, which are reputed to have extremely good isolation, and it is not usually fully realised that the cascode uses two transistors, and so comparison should only be made with other two-transistor configurations, when it can be seen that the common emitter pair is similar in isolation to the cascode. The conclusion? Use it as long as it is not an emitter follower. Remember, though, that a transistor pair will still have an effective feedback capacity of say 0.02 pF., which does not compare favourably with a single pentode valve.

FINAL PRECAUTIONS

The vital requirement of the output circuit is that it does not allow the output transistor to saturate. Saturation means that the transistor acts as a short circuit, losing its isolating properties. To present a low impedance to the collector, use a tapped coil, or a transformer with tuned secondary, or a parallel tuned circuit of enormous C/L ratio. To achieve the fairly large percentage bandwidth usually required, the load is arranged to reduce the Q to a sufficiently low value: wide-band couplers are more trouble than they are worth.

Example: Allow 75 ohms collector load. Frequency 1.8 to 2.0 Mc. Load presented by next stage: 100 ohms.

Use Q = 8 for response about 2 db. down at edges.

$Q = \omega CR \quad R = 100 \quad \therefore C = 6{,}800$ pF., so a foot or two of co-ax makes no difference.

Turns ratio $= \sqrt[2]{75 \div 100} = 1 : 1.15$. Use a primary of 17 turns, and a secondary of 20 turns on a ¼" diam. former, with a ferrite core.

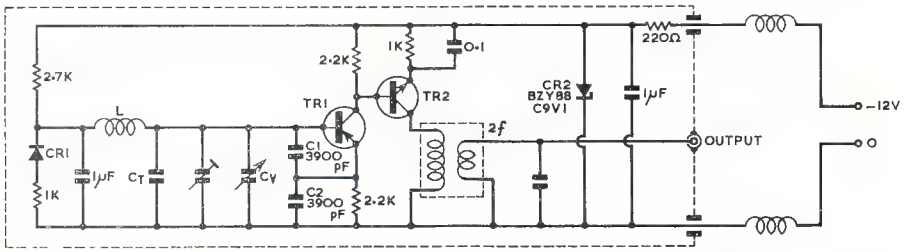

Fig. 4.—A practical Two-Transistor Oscillator. TR1 can be an OC171, in which case TR2 is a 2N706 and CR1 is an OA47; but if TR1 is a 2N706, TR2 is an OC170 and CR1 is a 1N914. Using the latter configuration, the polarities of CR1, CR2 and the supply should be reversed. The OC171 and OA47 are manufactured by Mullard, while the 2N706 and 1N914 are produced by Texas Instruments. C1 and C2 should be mica capacitors, and CT is an N750 ceramic, 150 pF. with a bakelite former or 75 pF. with a pyrex former. C1 and C2 have been chosen so that oscillation only just occurs, but if desired, they can be halved in value, together with CT, which will improve reliability of starting. A suitable arrangement for the output circuit can be evolved from details provided in the text.

Finally, we will consider feedback due to strays and common coupling. If the oscillator components are grouped close together, there is less chance of magnetic feedback, and of course they should all be in a thick aluminium box. It must be thick, not for screening (silver paper would do), but for stability resulting from the rigidity.

Power supply leads should be run close together, so that pick up on one is the same as the pick up on the other. Twin screened lead would be excellent, with feedthrough capacitors and r.f. chokes for supplying the oscillator box. The stabiliser circuit should also be in the oscillator box.

That concludes this short survey of oscillator stability problems, and suggests that a circuit as in Fig. 4 is the best answer, coupled with a careful (or lucky) layout.

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AUSTRALIS OSCAR "A" USERS' GUIDE

(Continued from Page 5)

it is a job for a computer, but this would require the recording of several telemetry cycles at various times. As far as individual operators are concerned, we would only expect a comment on the length of the sweeps across the earth. In this case, "fast" might be about one second; four seconds would be "slow". An average statement for each of the three axis is necessary.

Since computers do not take kindly to scientific information expressed in these terms, no columns have been provided on the telemetry form. A few words could be fitted in at the bottom of the sheet.

When the form is complete, please return to: Project Australis (Telemetry), Union House, University of Melbourne, Parkville, Vic., 3052.

Station Details

Stations tracking Australis Oscar "A" are requested to supply the following information about their station:

(a) Name and postal address of the operator.
(b) Call sign or station identification.
(c) Station latitude and longitude.
(d) Brief description of v.h.f. equipment such as antenna, pre-amplifier, converter and receiver.
(e) Brief description of h.f. equipment.
(f) Brief description of method used to decode the telemetry.

Please send these details to the above address, and send amended information whenever a major change is made in your equipment, together with the date of the change.

ACKNOWLEDGMENTS

Project Australis gratefully acknowledges the kind assistance of the following organisations. Without their help the construction of the satellite would not have been possible.

Acme Engineering, Melbourne—Radio Frequency Connectors.
Cannon Electric Ltd., Melbourne—Resistors and Connectors.
Ducon Condensers Pty. Ltd., Sydney—All Capacitors used in the satellite.
Fairchild Australia Pty. Ltd., Melbourne—All Semiconductors used.
Melbourne University Union—A generous grant for ground equipment.
Plessey Components Group, Sydney—One travel grant.
The Potter Foundation, Melbourne—Travel grants for two person to Project Oscar.
Pye Pty. Ltd., Melbourne—All Radio Frequency Crystals.
Rola Co. (Aust.) Pty. Ltd., Melbourne—M.A.S.S. magnet.
Sample Electronics, Melbourne — Circuit boards.
Turner Industries Ltd., Melbourne—Satellite antennae.
Union Carbide Australia Ltd., Melbourne—Flight and Back-up Battery packs.
Wireless Institute of Australia—A generous grant for running expenses.

Thanks are also extended to the Meteorology Department of Melbourne University and the Bureau of Meteorology, Melbourne, who have been most helpful during the construction of the satellite.

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VK6RH—R. Haslett. Not renewed.
VK7XX—D. B. McKelvey. Ceased operation.
VK9ZAF—A. Freitas (Bro.). Now VK9FS.

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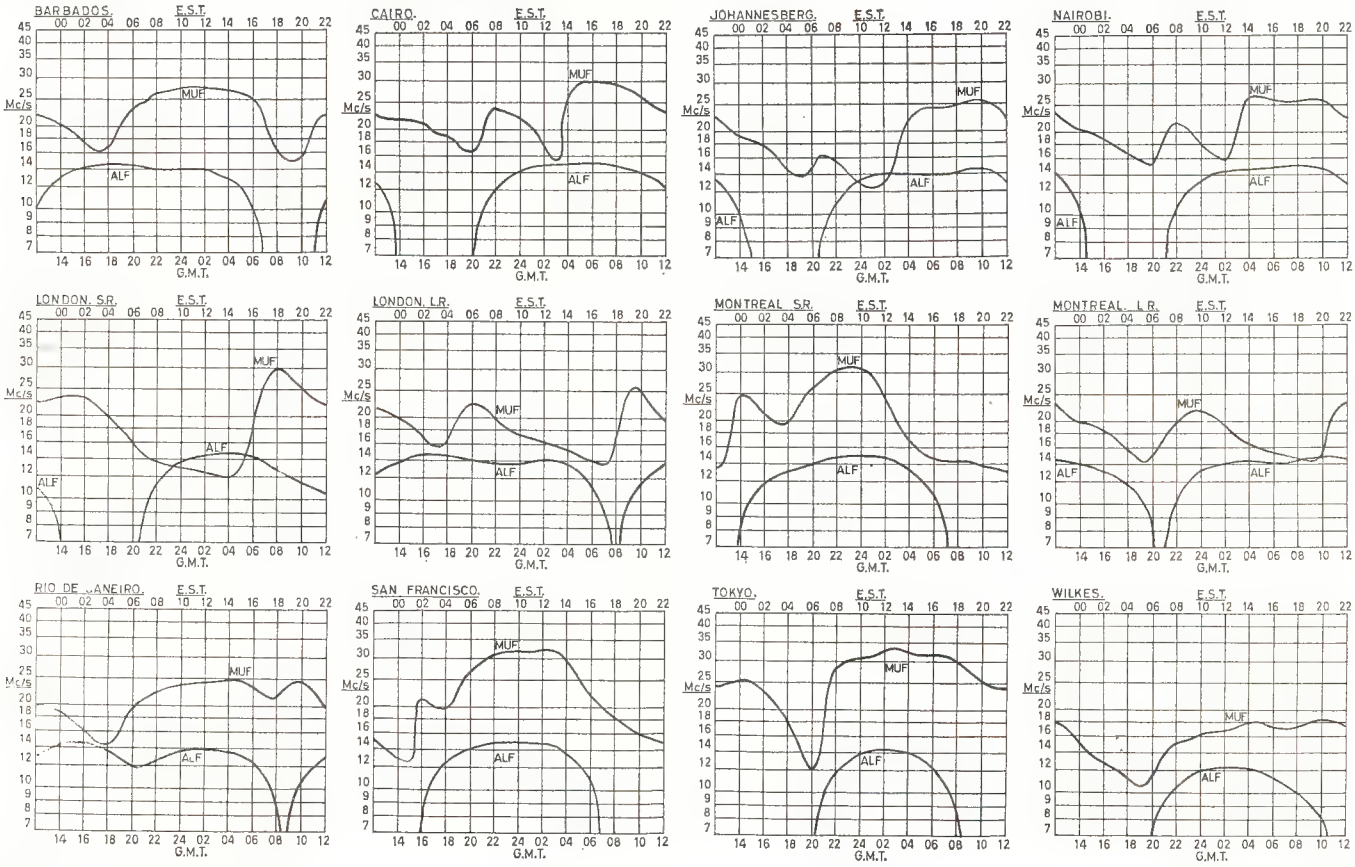
Remember, closing date for copy is 1st of each month.

PREDICTION CHARTS FOR FEBRUARY 1968

(Prediction Charts by courtesy of Ionospheric Prediction Service)



W.I.A. PLANNING I.A.R.U. CONGRESS IN SYDNEY

The Federal Council of W.I.A. holds its annual Convention in each State in rotation. This year it is the N.S.W. Division's turn to be hosts to the other Divisions over Easter 1968. However, this year N.S.W. have been requested by Federal Executive of W.I.A. to cater for a different form of Convention from that usually undertaken. That is, the W.I.A. Convention and an I.A.R.U. (International Amateur Radio Union) Congress will be held concurrently and jointly in Sydney this Easter. All Divisions have agreed that such a Congress is desirable, and a majority of Divisions have agreed that the venue should be Sydney.

This I.A.R.U. Congress move was made by Federal Executive some months ago when F.E. member David Rankin, VK3QV, indicated that he was off on a world trip on business. He was accredited as an official representative of the W.I.A., letters of introduction were sent to many overseas societies, and David was able to "sound-out" the possibility of their sending representatives to such a Congress if held. As a result of this personal contact, David was able to ascertain that in all probability representatives of A.R.R.L., R.S.G.B., N.Z.A.R.T., J.A.R.L., K.A.R.L. and other Amateur Societies would consider coming to Australia.

Accordingly, in view of this response, Federal Executive has sent invitations to I.A.R.U. headquarters (A.R.R.L.); Region 1 and 2 Executives, and the R.S.G.B.; and the following Amateur Societies in Region 3: N.Z.A.R.T. (N.Z.), J.A.R.L. (Japan), K.A.R.L. (Korea), M.A.R.T.S. (Malayasia), P.A.R.A. (Philippines), B.A.R.T.S. (Burma), R.S.C. (Ceylon), A.R.S.I. (India), P.A.R.I. (Indonesia), H.A.R.T.S. (Hong Kong), R.A.S.T. (Thailand), P.A.R.S. (Pakistan), A.R.S.I. (Iran), R.C.O. (French Polynesia). Also Amateurs in Singapore, Laos, Nepal, Afghanistan, Okinawa, New Caledonia, Fiji, and New Guinea have been circularised. It is hoped that those Societies that said they could send a representative do so, and that others can. It is realised though that many of the countries in South-East Asia will not be represented due to the smallness of the Amateur population, and because of currency restrictions, etc.

The stated aims of the I.A.R.U. Congress are:—

(a) Ultimate Aim.—To establish and maintain continual liaison between Region 3 countries with a view to presenting a united front at future I.T.U. conferences, and to maintain a programme of assistance to developing countries.

(b) Immediate Aim.—At Sydney in 1968, to establish an administrative and organisational framework to enable the achievement of (a) following perhaps the pattern of Regions 1 and 2.

The countries of Region 1 I.A.R.U. have had an Executive Committee since 1950, and at present the office-bearers are: Chairman, Lt. Col. Per-Anders Kinnman, SM5ZD (Sweden); Vice-Chairman, Roy Stevens, G2VBN (England); Secretary, John Clarricoats, O.B.E., G6CL (England); Treasurer, Ir. W. Dalmijn, PA0DD (The Netherlands); Members, H. Picolin, DL3NE (Germany), Janes Znidarise, YU1AA (Yugoslavia).

Region 2 organisation is similar, with its office-bearers: Chairman, Antonio Pita M., XE1CCP (Mexico); Vice-Chairman, J. Italio Giammattei, YS-1IM (El Salvador); Secretary, Gustavo Reusens, OA4AV (Peru); Treasurer, N. B. Eaton, VE3CJ (Canada); Members, Bob Dennison, W0NWX (U.S.A.), Miguel A. Czysh, LU3DCA (Argentina).

Our Region 3 (South-East Asia and Oceania) has no such organisation, but it is considered necessary to the preservation of Amateur frequencies by Amateurs in the other Regions, that such organisations be maintained. The last I.T.U. Conference at Geneva discussed frequencies on a world basis—it is expected that future I.T.U. Conferences will be held on a regional basis! So, W.I.A. feels that Region 3 must prepare for this, hence, in Sydney this Easter we hope to crystallise this feeling into a formal organisation of Region 3 Societies, with the help of our friends in Regions 1 and 2, and in co-operation with our neighbours in Region 3.

The overseas representatives will be the guests of Federal Executive of W.I.A. over the Congress period, so additional expense will not be incurred by Divisions, and the arrangements are in the hands of a joint committee of F.E. and the VK2 Division—notably Pierce Healey, VK2APQ, the VK2 Federal Councillor. Some W.I.A. Convention sessions will be held, but mostly the three days will be given over to discussion of I.T.U./I.A.R.U./Region 3 matters, both as they affect Australian Amateurs and Amateurs in Region 3 generally.

Over the past few years, W.I.A. has achieved agreement on its own internal re-organisation, viz. the new Federal Constitution; it has succeeded in gaining a clearly-stated and liberal set of operating conditions for Amateur operators, viz. the new Handbook; it has attempted to improve the Amateur's image by public service activities, viz. W.I.C.E.N. and Y.R.S., etc.. Now it feels that consideration should be given to aspects of international Amateur Radio, especially Region 3 liaison and assistance.

This I.A.R.U. Congress planning is a little like saying to friends and neighbours, "If we have a party, will you come?" They say, "Yes, very probably." You then set about organising it and send out invitations, and then sit back and hope they come! If they do, then Sydney will be the venue of the first Congress of its kind held by Radio Operators in South-East Asia.

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THE NEW HANDBOOK

This is the third and last, of the articles on the changes made in the new Handbook. It deals with a miscellany of minor points which, whilst not of major importance, will, at sometime or other, be necessary knowledge.

REPLACEMENT OF LOST CERTIFICATE OF PROFICIENCY

The "old" Handbook stated that if a certificate was lost it was necessary to obtain a Statutory Declaration from a Justice of the Peace or other authorised person before a new certificate was obtained. This is no longer a requirement and the new Handbook states:—

"**Paragraphs 25-26.**—In the event of an operator's certificate being lost, mutilated or destroyed, a duplicate certificate may be obtained by the holder making written application to the Superintendent Radio Branch, in the State in which the operator resides. If replacement of a mutilated certificate is involved that certificate should accompany the application. If, however, a certificate has been lost or destroyed, the applicant is required to furnish with his application a written statement summarising the circumstances under which it was lost or destroyed, and, if lost, an undertaking to return either the original or duplicate certificate if the original is located at any time."

BROADCAST AND T.V. LICENCES

Previously the need for licensed Amateurs to possess separate broadcast or television licences was not made very clear. The new Handbook now states:—

"**Paragraph 31.**—An amateur station licence does not authorise the operation of broadcast or television receivers. Equipment capable of being used for the reception of broadcast or television must be covered by an appropriate licence issued under the Broadcast and Television Act."

LOG BOOK

Until recently a Log Book was supposed to record, amongst other things, "the nature of the experiments carried out". In keeping with the recognition of the Amateur Service as such, and not merely a body of licensed experimenters, this provision has been redrawn and paragraph 85 sets out the requirements as follows:—

"**Paragraph 85.**—The licensee of an amateur station shall keep a log book or other suitable record in which must be entered—

(a) A chronological record of all transmissions;

(b) The frequency and type of emissions used;

(c) The station or stations with which messages have been exchanged;

(d) The address of the temporary premises or if operated in a portable or mobile capacity, the locality in which operated."

ADVERTISING/THIRD PARTY TRAFFIC, ETC.

In the past, statements of what constituted advertising were most ambiguous and in order to be quite sure he was not transgressing in this regard, the Amateur has tended to avoid even the use of proprietary names. Just one example of this is "Australia's Own Car" instead of Holden. In addition, the old Handbook specifically prohibited the use of Call Signs on letterheads. The latter prohibition has now been withdrawn and the statement of what an Amateur may not say on the air is set out quite simply as follows:—

"**Paragraph 80.**—The operator of an amateur station is not permitted to transmit—

(a) Messages or visual images on behalf of third parties;

(b) Matter which is profane, obscene, or otherwise objectionable;

(c) Any message or image in consideration of payment in cash or kind;

(d) Music (except for single audio tones or tests of short duration) or other form of entertainment;

(e) News of or on behalf of, or for the benefit or information of any industrial, commercial, political, social or religous organisation or any one other than the operator or the person with whom he is in communication."

RECORDING AND RELAYING TRANSMISSIONS

Prior to the issue of the new Handbook it was necessary to have Departmental permission before a recorder could be used to take down other Amateur's transmissions. Further, the actual recorder to be used had to be specified or inspected before such permission was granted. The new requirements are considerably less onerous and paragraph 110 states:—

"Messages addressed to an amateur station by any other licensed amateur station with which the licensee is in communication may, with the concurrence of the originating station, be recorded and transmitted, provided that the re-transmission is intended for reception by that originating station and that the call sign of the latter is not included in the re-transmission. The call sign of the station playing the recording shall be announced in the prescribed manner before and after such re-transmission."

CALLS AND TESTS

Call Signs.—The current requirement for station identification is that the full call sign of the amateur station and that of the station he is working be given at the beginning and end of each QSO, and at least every five minutes during the QSO. This is set out quite clearly in paragraph 112 where the word "session" can be translated as "QSO".

"**Paragraph 112.**—The operator shall transmit the call sign of the station being worked and the call sign of the station he is operating at the beginning and end of each session and not less frequently than once in every five minutes during the session. Stations transmitting radio teleprinter signals shall employ either the international Morse code using A1 or F1 emissions or telephony for identification purposes."

On the Air Tests and Unmodulated Carriers.—The situation covering tests and carriers is given in paragraphs 113 and 114 as follows:—

"**Paragraph 113.**—Except for brief tests for adjustments not exceeding 30 seconds, the licensee shall not cause a carrier wave to be emitted from his transmitter in authorised bands below 52 megacycles unless such wave is subjected to intelligible modulation. When it is necessary to make test Morse transmission the test signal shall be composed of a series of vees followed by the call sign of the sending station. On no account should an unmodulated carrier be allowed to remain on the air on such frequencies. For tests exceeding 30 seconds an artificial aerial should be used."

"**Paragraph 114.**—In bands above 52 megacycles the use of an artificial aerial is not necessary for each test provided adequate means of station identification are used."

It is to be hoped that the situation on the v.h.f. band is now quite clear. Unmodulated carriers are permissable, provided that the station gives full identification every five minutes. The practice of running unmodulated carriers without identification for long periods is not permitted, indeed it never was.

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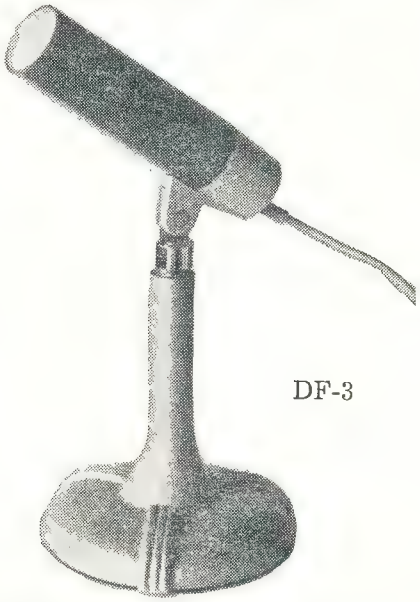

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FIFTY AND OVER

"VK3ZFC, VK3ZFC, VK3ZFC. This is VK3ZOM calling you, Bert . . . Oh, there you are. This is VK3ZOM in duplex cross-band contact with VK-3ZFC. VK3ZFC on two metres, VK-3ZOM on six. And how are you, Bert? Anything new your end? No. I haven't been on six metres for the last few days. I've been too busy.

"Was I doing the garden? Oh no, Bert, nothing like that. I've been communicating. Yes, that's right. That's what I said. Communicating. And it's really all your fault. You see, it all started when you lent me those overseas amateur radio magazines. They were full of CQ contests, DX-peditions, WAC awards and all the rest. And then those advertisements. I couldn't even get over the fence until I bought my new Deadduck Super Snifter Seven Thousand. And the kilowatt rigs and the aerial farms . . . Oh boy . . .

"What's that, Bert? You thought I was interested in radio, not in talking? That's true. But this kind of thing gets you hypnotised. Like drink or drugs I suppose. Anyway, the more I read the more I decided I'd have to get some DX award to stick up on the wall. I just had to. Couldn't sleep for thinking about it. So there you are.

"Going to get a full ticket? Oh no, Bert, nothing like that. Even if I gave up radio and studied Morse I'd still have to go s.s.b. All the advertisements say it's the only thing nowadays. And they all say you can't build anything like their super snifters and so I'd have to buy one. Then I'd have to get in the rat race, put up an aerial farm, subscribe to the DX-peditions and I wouldn't even have time to look at a resistor for the next ten years.

"Well I had that five hundred dollars that Auntie Florrie left me last month so I just waded in and spent most of it. And I haven't had much sleep for the last week. But it's been worth it. I'll get my certificate. I've worked all States, worked all continents, logged over a hundred different countries and best of all, I've got it out of my system. Don't want to have another overseas contact for the next ten years.

"Mind you, Bert, it wasn't easy. I had to wait until four in the morning before I could contact anyone in Tibet. Funny hours they seem to keep there. Europe was easy and I got on to G-land and Eire straight away. Venezuela was hard and Alaska took a bit of getting. Oh yes, and I had a contact with a YL in Timbuktu. I always wanted to talk to Timbuktu. Mind you, Bert, when I say 'talk' I didn't really say anything. No time. Just 'how are you?' readability and strength report, and time check for the log. I couldn't stand too much of that kind of thing. Drive a bloke nuts it would.

"What power was I using? Well to be honest, Bert, I don't quite know. You see it was all commercial gear. But the gear was okayed by the P.M.G. so it ought to be all right. Did I do it by using somebody else's call sign? Oh no, Bert. That's not legal. You know I wouldn't do a thing like that.

"You still don't understand? Well I figured it this way. The main thing is to prove that you've talked to all these countries. It doesn't matter what gear you use or whether you've built it yourself. Nobody does anyway, according to the advertisements. Now you know the rent-a-car service? If you want a car just for a day or two, you don't have to buy one. Instead of paying five thousand dollars to buy a fancy car you pay fifty dollars and hire one. So that's what I did with the gear. I hired it.

"What about a licence? Oh you automatically get one while you hire the gear. That's what makes it so easy.

"Kidding? No, Bert, of course I'm not kidding. Where did I hear about it? Why out of that big fat book everyone has. Of course you have one. In the hall. That's right, the telephone directory.

"What do you mean, Bert? It isn't radio? Of course it's radio. I made sure that every call was put over on a radio telephone link. I wouldn't book one unless they told me it was. Really, Bert! I don't see the need for language like that. Specially over the air. Maybe you wouldn't be satisfied but I am. I've worked all continents, over a hundred countries—including Timbuktu—and all States; and I'll bet that not many blokes use a rig as expensive as the one I used. So now I can relax and forget about it and look at my certificate. What's that? Of course I'll get a certificate. The itemised phone bill of course. Nobody's going to be able to argue with **that** . . .

"Well that's about it from this end, Bert. I guess I'll go to bed early and get some rest. Cheers Bert. See you later.

"This is VK3ZOM concluding a duplex cross-band contact with VK3ZFC and having a quick look round the two metre band. Local contacts only please chaps! No more DX. I've had it."

—Roy Hartkopf.

— . . . —

AMATEUR RADIO IN TURKEY

Amateur Radio is illegal in Turkey at the present time and has been so for many years. The general opinion is that it is only a matter of time before a law is passed to make Amateur Radio legitimate, but that there are at the moment far more important matters to be considered by the legislature. Consequently all Amateur Radio operators are "under cover" and could be imprisoned if their activities are detected. It is thought, though, that the authorities are aware of the present situation and are prepared to tolerate it so long as the Amateurs do not interfere with other services or provoke complaints from the public.

There is undoubtedly great interest in short wave radio in Turkey and the Turkish Radio Amateur Club, with headquarters in Istanbul, runs a monthly magazine which has a circulation of around 4,000 copies! It is difficult, of course, for the editor of the magazine to get articles—the editor of "Monitor" has exactly the same trouble!—and photographs and descriptions of shacks for publication. Should any League members wish to help in this matter, they may send photographs and details of their equipment to myself and I will forward them. They will be very welcome.

Because of the "cloak and dagger" nature of the operations, the identity of most TA Amateur stations is known only to themselves. At least fifty calls have appeared in recent years and there is of course no definite proof that all of these stations have been in Turkey. The League will forward all QSL cards to a central address in the country, which could produce replies, but which might on the other hand not do so. Even if the Amateurs receive the cards, they will not be able to reply with cards bearing their addresses. It is all very complicated and since there seems no reason why Amateur Radio should be forbidden in Turkey, it is to be hoped that before very long this medium of international goodwill will achieve its rightful place in that country.

(The Editor of I.S.W.L. Magazine, "Monitor," August 1967.)

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TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

DX

Sub-Editor: ALAN SHAWSMITH, VK4SS
35 Whynot St., West End, Brisbane, Qld., 4101

By the time this reaches your mail box the New Year will be just another fading memory. The resolutions made will have already, quite likely, been broken, and somehow instead of the big things planned you are back in the grip of that one unchangeable facet of our existence—the daily grind. Well if the rut seems deeper and the salt mound higher, try a little escapism into DXing. 1968 promises to be big in rare ones. No one will deny that working a new one "makes" the day.

Let's first take a glance at how the bands are performing—and "nicely" is the right word for them at the moment.

Ten Metres: Almost nightly around 1000z Europeans are workable. A few Asians put in an appearance sometimes a little before this. All U.S.A. can be contacted, usually between 2200 and 0200z.

21 Mc. is good and steady to Europe from 1030 and often lasts for several hours. Some rare calls are beginning to appear on it. During each day openings occur to Central America at 0200 and the Ws are constantly audible even from 1700z. It is in fact open almost 24 hours each day.

20 metres seems a little quiet, but always has some worthwhile DX on it. From 1600z many African calls appear on the SR and at big signal strength.

7 Mc.: This old faithful still lets an odd DX call through around the times of 1030, 1630 and 1900z. However, the band is but a shadow of its former self when it was possible to W.A.C. daily.

80 metres: Very little besides Asians and the U.S.A. Some solitary calls to appear have been VQ9JW, KL7FA, 9V1NV and CX8F. All close to low end.

NOTES AND NEWS

Yemen; It is reported that HB9KV is still QRV using the call 4W1KV. 28605 0800z. 14240 a.m. 1800. QSL via HB9 Bureau.

Greenland: These are active as of now: OXs 4AA, 4AB, 4AC. All 14 c.w. 2300.

Liechenstein: HB0AG is a permanent resident in this tiny country. Gives his activity as 14, 21, 28 Mc. and all modes.

Swaziland: The now familiar ZD5X is up on 80 mx looking for VK. Try around 1830z, low end.

Liberia: EL8D on 14 and 3.5. QSL SM3BNV. (The above by favor of "Air Waves," J. Coote, G3UGT.)

Easter Is.: CE0AC 14115 0630. CE0AE 21345 1430.

Glorieuses Is.: FR7ZQ/G 14097 1600.

Indonesia: Several are active: PK8YBC, PK8YAK, PK8YFE, PK8YZZ all 14 s.s.b. 1100. Also PK1SH 14030 1300.

South Orkney Is.: VP8JD 14135 1900. QSL VE3ACD.

Bouvet Is.: 3Y0EB—Overseas Bulletins report that this call will be valid from 1/1/68 and **not before this.** The call 3Y0AB was held by Don Miller but this call **expired** on 1/1/67. 3Y0EB is expected to be QRV for five months.

Marion Is.: As reported before, his mode is 14140-160 a.m. 1630.

Rio de Oro: EA9EJ has a big sig here 14080 1930. Also 14132 2100.

Rhodes: SV0WY 14035 1700-2000. P.O. Box 66, or via W1RPW.

Crete: SV0WL 14120 1800 and later. QSL to W2CTN.

South Georgia: VP8JQ 14025 2300.

Bonaire: PJ5BC 21357 1216, 14200 1900. QSL K0GZN.

Turkey: TA2BK and others QRV 14 c.w. 1700 approx. TA2BK also sometimes on 14102. QSL to DJ2PJ.

Bahrain Is.: MP4BGE 14193 1500. Also MP-4BRA 14 c.w. 1800.

Tanzania: 5H3KJ 14190 and 21293 2250. QSL P.O. Box 9070, Dar-Es-Saalam.

Montserrat: Dick VP2MO 15214 2230 and 14 c.w.. 1930. QSL WA8RWU.

Iran: EP2CA 14196 1400. EP3AM 14192 1500.

Mauritius: VQ8CC 14196 and 14 c.w. 1600.

Monaco: 3A2MJC 14230 1500. This is a Club station.

Kuwait: 9K2AM 14195 1500. 9K2AB 14350 1600.

Tunisia: 3V8BZ 21351 1600.

Antarctica: VP8JI 14205 0000.

Malawi: 7Q7EC 14227 1510. Will be QRT in a few weeks. Also worked here 14035 2000.

Ghana: 9G1ED 21307 2215. 9G1FF 21291 1600.

Angola: CR6FX 21345 1700.

Palmyra Is.: Reported activity by K6CAA who has the call KP6AP. 14 c.w./s.s.b.

Malagasy Rep.: 5R8AM 14035 1700. Also others active.

Marcus Is.: KG61F still workable on 14 c.w. and s.s.b. 14260 0700.

Mariana Is.: KG6SA Saipan, 14210 0630.

St. Paul Is.: Worked here on a.m. FB8ZZ 0300 14110.

Cuba: CO8MN 14198 2200. QSL to QTH in CB.

Sierra Leone: 9L1JJ 21310 1700.

Canary Is.: EA8FG 14135 1800.

Dominica: VP2DI 14187 2030.

Faroe Is.: OY7ML 14225 1300.

Laos: Several active: XW8BJ, XW8BP, XW-8CA, XW8CAL, etc. On 14 and 21 Mc. c.w. and s.s.b. 1000.

Brunei: VS5MH reported back on the air on 14 c.w./s.s.b. Try 1100. (VK4UC)

Tahiti: FO8BS 14115 0500. FO8BU 14100 c.w. 0600. FO8BV 14048 0300. (ZL2AFZ)

Spitzbergen: JW7YF 14080 1500. QTH Svalbard.

Zambia: 9J2JT 28550 1800. 9J2WR 28410 and 28590 1900. Also try 0600.

Finland: OH5UQ 7005 1900. A regular on this band, Paul is seeking a VK6 QSO on 40 at this time or around 2030. Other EUs workable at this time.

Mozambique: CR7AE 21245 1500z. Also CR7IZ comes up on 14 c.w. around 1900. Will come up on 7005 if a sked is required.

Rwanda: 9X5PX 14102 1900. 9X5AA 14232 1600. 9X5MW 14190 2300.

San Felix Is.: CE0XE, 21015 Kc. at 1500z, also on 14008 at 1300z. QSL to XE1NZ.

Saint Maarten: Jose PJ2MI 14172 s.s.b. Can be broken with c.w. and will listen on phone band as requested, 2200z. QSL via VE3EVU.

Chad Rep.: TT8AG 14044 at 2240z. QSL via W4DQS.

Senegal: 6W8DQ 14193 0000. QSL P.O. Box 571, Dakar.

Svaalbard: JW5YG in Spitzbergen, 14238 at 1711z, via long path.

Kenya: Fred 5Z4KO 14207, long path, at 1433z, also Andre 5Z4KL 14180 0330z. QSL to Box 30035, Nairobi, Kenya.

Ethiopia: Dick ET3REL 14192 at 1455z. **Note:** 9E3USA new prefix for ET3USA.

Cypress: ZC4RB on 14216 long path at 1705z.

Cape Verde Is.: Juillo CR4BC 14225 at 2208z.

Algeria: Harry 7X0AH 14198 at 1624z. On all bands.

Trinidad and Tobago: 9Y4VT on 14210 1145z. Name Cyril, QSL to W3DJZ.

Kazakh SSR: Jalley UL7YA 14109, listening 14230 Kc.

Gibraltar: Jack ZB2BC 28555 at 1730z. QSL via ZB2A.

Jersey Is.: Eric GC2FMV 28570 at 1530z.

Revileo Gigedo: XE boys are rumoured to be planning an XE4 DX-pedition.

Fanning and Christmas Is.: Ed de Young, K6CAA/KH6, KP6AP/KH6 has a tentative trip planned to Fanning Is. with a University of Hawaii Scientific Study Group some time in February '68.

Syria: YK1AA 14205 s.s.b. 1300z-1400z. Also 1457z.

Cameround: Gus TJ1AJ 14055 2130z.

South Rhodesia: ZE3JU continues active, recently on 21303 at 1558z.

Gambia: ZD3D 14105. QSL via W9JVF.

Nauru: VK9RU plans to go to Nauru 15th February.

South Georgia: VP8IE on 14195 at 0200z, working VP1.

Gabon Rep.: TR8AI c.w. on 14040 at 2300z. Also Guy TR8AG 14150 at 2300z.

ACTIVITIES

Dud VK4MY seems to have been busy this month as indicated by the following list: UT5UK 14030, 7X0AH 14010, UF6ACR 28060, KR8EA 28070, XW8BP 14020, ZS5LB 14050, ZD5X 14040, 4S7DA 14040, DL8ML 28010, PJ3CC 28010, UW0SX 28010, HM5BF 21050, DU7SV 21040, UA9OV 14020, TG0AA 14030, TR8AI 14070, CM2QN 14065, IT1GSA 14030, TA1AV 14008, UN1BR 14050, EA8FJ 14010, VP6PJ 14040, CT3AS 14030, VP1DM 14060, HP1IE 14060. On s.s.b.: KS6CL 21330, PK8YBC 14170, VU4UK 14130, UB5ID 14195, VK0GP 14180, VP6AO 14170, CP-1GD 14185, 9G1FF 14180, CR5SP 14190, PK8YZZ 14185, KC6JC 13215, 5H3KJ 14150, 5Z4KL 14170, UB5SR 14140, CO8MN 14160, CO2NR 14190, VP-8HZ 14120, VP2MO 14190, ZP5KN 14110, 9U5BB 14170, CE3UF/0 14110, CE3ZN/0 14100, FR7ZG 14200, FR7ZD 14050, VQ8BZ/R 14250. Mainly between 0700 and 1400z.

Ken VK3TL comes to hand with his usual choice ones and reports one or two new prefixes. So apt is Ken at picking the "cherries" that I'm beginning to suspect he uses some added secret gimmick, akin to the "olfactronics box" which is an electronic "sniffer" for faint odours. 14 Mc.: CE3UF/0 (Juan Ferdandez), also CE0PK, CN8AP, CR6IS 1500, EL0A 1400, FH8CD 1400, FR7ZC, HC4BS, HM5CL, PK8YAK, TG5HC, UG6JJ, VQ8CBN, VQ9B, 4L3A, 5Z4RS, 9J2LK. QSLs received: VS9HRV (Kuria Muria), LX1SD, YU6GB, 3B1BD, CX1OP, FW8AC, CX-3BBD, VP5RS, EL2T.

Chas VK4UC, temporarily exclusively s.s.b., notched these "niceies". Has also made s.s.b. D.X.C.C. these past few weeks. Reports conditions as good, particularly to Central America around 1100 on 14 Mc.: KG6SA, K8NHW/XV5, VP2MO, FW8RC, TI2CAP, KZ5FN, 9Y4VT, PJ2MI, PZ1BW, YS1JL, 9M6MW, 9Y4AR, ZP5JB, VP8JI, 5H3KJ, FY7YM, CE3ZN/0, PJ2CE, VQ-8CBN, VQ9DH, VP6NS, VQ8GG, 9U5BB, FH8CD, VP2AZ, FO8BV, VP1PV, PZ1BF, VQ8CB/A, HS1CH, VP2AA (Antigua), VP2GBC (Grenada), 7Z3AB, 7Q7EC, PK8YJO, M1B, VK0IA (Macquarie), VS6DJ, ET3REL, OD5FA, 6Y5DW, 5W1AT, VS6CO, ZF1GC, VS9MB, AP2NR. Chas reports activity from W. Samoa as 5W1AT, 5W1AS. The former is ex-ZK1AR. New prefix for the VP6 boys is 8F6. (Thanks Chas OM)

STOP PRESS—NEW ONE. 1st UP. RED HOT

Exotica.—Where, where is it? Easy, just close your eyes, lean back and relax. Allow your mind free imaginative rein. Follow your fancy where it listeth. If you like, to some sub-arctic barren rock, where the icy ground is yet virginal to the defilement of a Ham antenna—or if you prefer the warmer climes, take out the world map and settle for some spot tropic and erotic.

Romantic, huh? Well, you can bring it true. Just be practical enough to pick some place acceptable for DXCC, and I've got the operator who will go.

All that is needed is the cash for the trip, all the gear, some pocket money (just in case), someone to print the QSLs and a manager who will see that he gets an s.a.s.e. plus 3 I.R.C's for every card sent out—and you are in business.

Exciting isn't it? Could anything be more in the fraternal spirit of **Shamateurism** (pardon my spelling).

P.S.—I suppose it doesn't really matter if the operator goes to **Exotica** or not, so long as your call is in his log and it counts for DXCC. It's only a matter of mental association. Don't let the small matter of a **permit** deter you either!

SOME QTHs

5H3KJ—P.O. Box 9070, Daar-es-Saalem.
EA8FG and EA8EX—P.O. Box 215, Tenerife, Canary Is.
TT8AR—P.O. Box 466, Fort Lamt.
UA1CK/JT1—P.O. Box 88, Moscow.
6W8DD—Noel Le Gall, P.O. Box 190, Dakar, Senegal. (VK6OV—Tks. Inge.)
7Q7EC—P.O. Box 207, Zomba, Malawi.

TA1AV—SM0KV.
VP6PJ—WB2UKP.
VP6AO—VE3DLC.
KC6JC—W2RDD.
VP2MO—WA8RWU.
9Y4VT—W3DJZ.
VR1L—K6UJW.
9I3AB—W6BAF.
KS6CF—W4ZXI.
6O1BG—W1YRC.
ZE5JJ—W6BAF.
BY5PX—VU2LM.
VP5AA—W1WQC.
PZ1BW—VE3EUU.
FM7WQ—W4OPM.
5U7AL—W4WHF.
TU2CA—YASME.
FY7YI—W3AYD.
CE0PC—DL9KRA.
CE0PK—WB6GOV.
TG5HC—WA8LST.
PJ2MI—VE3EUU.
3A2JMC—3A2EE.
VP2AZ—W0NGF.
VP6WR—W4OPM.
XW8BQ—WA4ZTW.
VP1PV—Box 17, Cayo.

The following stations have the address of P.O. Box 7388, Newark, N.J., 07107, for their QSLs: CN8FF, CN8FV, CR5SP, G5AAM, HK-0AI, I1RB, I1RBJ, DL6OT/LX, OK4CM, OY-2GHK, VK9DR, VK9XI, VP7CX, VP7NY, VP-8IE, VQ9G, VY9AA, ZD8AR, ZD9BE, 7Q7BFD, 9J2BK, 9X5GG.

AWARDS

WVDXC—Willamette Valley DX Club Special Achievement Award.—This club will award an attractive certificate attesting honorary membership to any DX station having QSOed ten or more club members. Contacts must be made after 1/1/56. Usual requirements apply. Send a double certified list to P.O. Box 555, Portland, Ore., U.S.A. Any band, any mode.

Some WVDXC members are W7s AC, AMX, BTH, CWE, DAA, DIS, DJY, DLR, DZL, ECI, ENW, FB, GBW, GHB, GJ, GXA, HIA, HKT, IAM, IYW, KSA, MGT, MVC, OCL, PB, QON, QY, TMF, TML, VEU and others.

SOME SNIPPETS FROM HERE AND THERE

Norway.—Now has reciprocal licensing with U.S.A., only as yet. This is the first Scandinavian country to take the step.

M.I.A.R.—Marshall Island A.R. Radio Club. Operated by five U.S.A. Corps Ops., 14245 0900. Looking for QSOs.

Southern Ocean Boys.—FB8XX, FB8ZZ, and FB8WW have a daily four-way with 5R8BC 14140 0300. QSL manager for FB8WW, W4MYE.

Zone 23 can be determined by the letter Y after the UA0 prefix. Such as UA0YE, who is QRV 14037 0130.

(Continued on Page 19)

Okinawa Beacon Station.—Continuous operation on 29000. Call is KR6TAB. Reports are solicited via the bureau.

Surinam.—PZ0AA is a special licence call. 14200 2300. Also 0000.

YL International SSB'ers Inc.—In reply to many enquiries seeking more information on this great organisation, might I suggest that you tune into the VK-ZL system which is controlled by ZL2JO. Each Saturday at 0300. Thelma will be glad to answer any questions.

AHC-DX Award Hunter's Club.—An s.a.e. to VK4SS will bring you all information and details you require. Also details of "XL" Ops. Club.

LIDXA.—Long Island DX Club. This club runs a yearly DXCC Contest. This association with up-to-date ideas on the totem pole, issues certificates to each country winner. Now's the chance to see what you can do for VK. All information can be had from secretary W2FGD, P.O. Box 74, Massapequa Park, N.Y., 11762.

SUMMARY

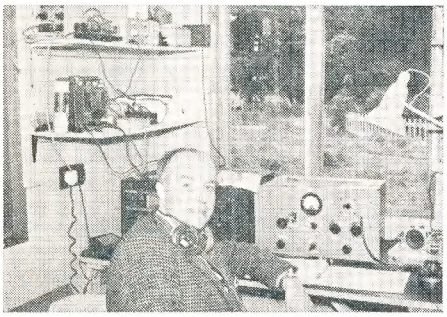
Information for this column is received from several overseas sources: LIDXA, Fla. DXer, K6BX publications, I.A.R.J.S., Air Waves, Geo Studd, ZL2AFZ, DX Editor "Break-In," etc.

My gratitude also to all VKs who already in 1968 have taken the time to put pen to paper re DX information.

Oceania DX activity is badly needed now pse. 73 DX, good hunting, Al VK4SS.

— . . . —

DX-ER OF THE MONTH



G2FFO—DICK JOHNSTON

Dick's QTH is 1 Oremrod House, Higher Red Lees, Cliviger, Burnely, Lancs., U.K. He is active and always keen to work VKs on any band. He is on 7, 14 or 21 Mc. when the bands open. He is a member of F.O.C., T.O.P.S., C.A.C., C.H.C., R.N.A.R.S., R.A.O.T.A., O.T.C., etc.

The following awards have been claimed: DXCC 275 plus, USA-CA, WBE, WAZ, BERTA, DDXA, AAA, WPX, WAE, DUF-4, WAVKCA, WAS and many minor ones.

Dick was first licensed in 1938 at the age of 15 years with a G artificial licence. He served in the R.N. in World War II. and was in the Australian States about that time en route to VS6 land.

A real nice bloke and a credit to Amateur Radio. Give him a shout if you hear him.

— . . . —

PROVISIONAL SUNSPOT NUMBERS FOR OCTOBER 1967

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R.	Day	R.
1	72	16	41
2	69	17	36
3	96	18	50
4	89	19	62
5	98	20	83
6	92	21	80
7	88	22	86
8	76	23	101
9	80	24	93
10	82	25	114
11	90	26	125
12	66	27	125
13	55	28	156
14	64	29	133
15	47	30	133
		31	100

Mean equals 86.5.
Smoothed Mean for April 1957: 81.5.

Predictions of the smoothed monthly Sunspot Numbers for the coming six months:

November	99	February	105
December	101	March	107
January	103	April	109

Rules for the Heard All VK Call Areas S.W.L. Award

OBJECTS

1.1 This award was created in order to stimulate interest in the logging, by overseas Short Wave Listeners, of the various Call Areas of the Commonwealth of Australia and its Territories and to give successful applicants some tangible recognition of their achievements.

1.2 This award, to be known as the H.A.-VK-C.A. Award, will be issued by the Wireless Institute of Australia to any Short Wave Listener in the world who is a member of an affiliated society of the I.A.R.U. who satisfies the following conditions. No S.w.l. resident in Australia or its Territories will be eligible for this award.

1.3 A certificate of the award will be issued to the applicants who show proof of having logged stations in all of the Australian Call Areas as listed in the Appendix. No endorsements are available.

REQUIREMENTS

2.1 Verifications are required from all the Call Areas of Australia and its Territories as shown in the Appendix. In all, 22 verifications are necessary.

2.2 The commencing date of the award is 1st January, 1946. All loggings made on or after this date may be included.

OPERATION

3.1 Loggings may be made of Australian stations using any authorised frequency band or type of emission permitted to Australian Amateurs.

3.2 Credit may only be claimed for logging stations using regularly-assigned Government Call Signs.

3.3 Loggings of ship or aircraft stations in Australia or Australian Territories will not be eligible, but land-mobile or portable stations may be claimed, provided their specific location at the time of logging is clearly shown on the verification.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that specific loggings have been made.

4.2 Each verification submitted must be exactly as received from the station logged, and altered or forged verifications will lead to the disallowance of those items and may lead to the disqualification of the applicant.

4.3 Each verification submitted must show the date and time of transmission, type of emission and frequency band used and the location or address of the station at the time of loggings.

4.4 A check list must accompany every application setting out the following details:—

4.4.1 Applicant's name, S.w.l. number, if any, and address;

4.4.2 Name of affiliated Society (see Rule 1.2);

4.4.3 Details of each logging as required by Rule 4.3.

APPLICATIONS

5.1 Applications for membership shall be addressed to the "S.w.l. Awards Manager," G.P.O. Box 2611W, Melbourne, Victoria, 3001, Australia, accompanied by the verifications and the check list (Rule 4.4). Sufficient International Reply Coupons (I.R.C.) must be enclosed to cover return postage of the verifications to the applicant.

5.2 Where a reciprocal agreement exists between the W.I.A. and the applicant's Society, the appointed officer of that Society may carry out the check, and if correct, may forward a written application for the award on behalf of the applicant. The list (Rule 4.4) must also be forwarded.

5.3 Applications will be examined by the S.w.l. Awards Manager, who will arrange for the award to be forwarded either direct, or through the applicant's Society as required.

5.4 In all cases of dispute, the decision of the S.w.l. Awards Manager, and two officers of the Federal Executive of the W.I.A., in the interpretation and application of these rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them as necessary.

APPENDIX

Territory	Call Area	QSLs Reqd.
Australian Antarctica Heard Island Macquarie Island	VK0	1
Australian Capital Territory	VK1	1
Lord Howe Island State of New South Wales	VK2	3
State of Victoria	VK3	3
State of Queensland Thursday Island Willis Island	VK4	3
State of South Australia	VK5	3
State of Western Australia	VK6	3
Flinders Island King Island State of Tasmania	VK7	3
Northern Territory	VK8	1
Admiralty Islands Bougainville Island Christmas Island Cocos Island Nauru New Britain New Guinea New Ireland Norfolk Island Papua Territory	VK9	1

Note: In areas above, where more than one confirmation is required, loggings may be made with any or all of the Territories listed in brackets.

W.I.A. H.A.-VK-C.A. AWARD (S.W.L.)

Listed below are details relating to those Overseas Short Wave Listeners to whom this certificate has been awarded.

Cert. No.	Call	Date Awarded
1	SM0-2086	9/11/66
2	UA0-29108	21/11/66
3	UA9-9849	11/2/67
4	W2-6893	27/2/67

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OTL/78

Wireless Institute of Australia
Victorian Division

A.O.C.P. CLASS
(Theory only)
commences
TUESDAY, 20th FEB., 1968
from 8 to 10 p.m.

Persons desirous of being enrolled should communicate with Secretary W.I.A., Victorian Division, P.O. Box 36, East Melbourne, 3002 (phone 41-3535, 10 a.m. to 3 p.m.) or the Class Manager, Tuesday evenings.

TECHNICIAN REQUIRED

Melbourne professional engineer requires part-time assistance from capable Ham or equivalent for design, construction and testing of specialised electronic equipment.

Telephone Melb. 49-2910
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HARBROS

Require the services of a keen radio communications Engineer, to assist in the design and supervision in the manufacture of our expanding range of equipment.
The Engineer sort must have practical experience, as well as technical knowledge of transistors, single sideband and mobile equipment.
Salary in accordance with experience and qualifications. Assistance with housing and transport.
Written applications should be addressed in confidence to:—
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Repairs to Receivers, Transmitters; constructing and testing; xtal conv., any frequency; Q5-ers, R9-ers, and transistorised equipment.
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430 Elizabeth St., Melbourne. Ph. 34-6539

VICTORIAN NATIONAL PARKS AWARD

As a result of activities over the Xmas holiday period, we have progressive scores as listed below:—

Worked From All Victorian National Parks

VK3AFQ	18	VK3LC	1
VK3APD	15	VK3YQ	1
VK3ATN	2		

Worked All Victorian National Parks

VK3XB	20	VK3AFJ	10
VK3LC	15	VK3OM	7
VK3YQ	15	VK3AOM	6
VK3ARZ	11	VK3ACS	5

A full report from Harold VK3AFQ will be published at a later date. It is known that many other stations have worked a number of parks, and they are requested to forward their progressive scores to the Secretary, VK3 Division, for listing.

— . . . —

FEDERAL QSL BUREAU

VK2, 3 and 5 Hams were pleased to meet Mort Brewer, W6JU and XYL Marion during a short visit to Australia in December. Mort is offsider to John Knight, W6YY, in N.B.C. t.v. circles in Los Angeles. Mort is spending all January in ZL.

The only Amateur in the 1968 Macquarie Island team is Dave James, VK0IA (ex VK3IA, not yet published, and VK3ZPO). Dave states he has a QSL manager but at time writer contacted him on 14 Mc. c.w., Dave could not remember his manager's name or call!! Until this information is available all QSLs for Dave to this Bureau please.

Dates for the 1968 B.E.R.U. Contest are March 9 and 10—usual duration. F.O.C. members also please note the new dates for the annual Marathon are 23rd and 24th March, 0001z to 2359z.

VK3 Amateurs were pleased to meet VK-6WT, Dave Couch, on a visit to his parents in Sandringham during December/January. Dave is a Victorian by birth, but now seems to have been brain-washed by his long sojourn in VK6.

Results of the 1967 V.E.R.O.N. P.A.C.C. Contest shows the only VK listing as VK2AVE with almost a check log score. The 1968 P.A.C.C. Contest is scheduled from 1200z April 27 to 1800z April 28. All bands, all modes, cross bands and cross modes are permissible. Full details from this Bureau.

Good to hear from that globe-trotter, Jack Elliott, ZL3CC. Jack's most recent tour was to South America. He is active again on 14 Mc. and states "I have not resumed employment since my return from S.A. I will be 80 years next April." Jack has been a vegetarian for the past 40 years—there must be something in it!

No mail damaged in the fire in the Melbourne Mail Exchange on 27th November has been received at this Bureau. Any QSL despatches must have either escaped the blaze or were entirely consumed. Surface mails from ZA, ON, OK, OZ, OH, G, DL, PA, HA, I, OD, ZL, LA, SP, HB and YU were affected.

QSL totals for the eleven months Feb.-Dec. 1967 reached 88,234 cards—the highest handling ever recorded. However, with the new set-up gradually taking place, a vast reduction is expected in the current year.

Writer was handed a lemon this year by Father Xmas, as on Xmas day a broken left leg was suffered. Had I been a phone man, am sure the vet. would have shot me right away, but knowing c.w. sires are at a premium these days, he decided to preserve me for that purpose. Will all concerned please bear with any delays as am only ten per cent. mobile for the remainder of January and part of February.

—Ray Jones, VK3RJ, Manager.

AMATEUR FREQUENCIES:
ONLY THE STRONG GO ON—
SO SHOULD A LOT MORE
AMATEURS!

GOSFORD FIELD DAY

SUNDAY, 25th FEBRUARY, 1968

at **GOSFORD SHOWGROUNDS**

Trade Exhibits, Fox Hunts and Scrambles, Ferry Trip and Bus Tour, Lunch, Morning and Afternoon Tea supplied.

BRING YOUR QSL CARD

HAMADS

Minimum 50c for thirty words.
Extra words, 2c each.

Advertisements under this heading will be accepted only from Amateurs and S.w.l's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. **Copy** must be received at **P.O. Box 36, East Melbourne, Vic., 3002,** by **5th of the month** and **remittance must accompany** the advertisement.

COLLINS KWM1 Transceiver, 14 to 30 Mc., continuous coverage. VOX, ALC, S Meter, Cal., etc. Excellent performance and condition. $250. P.O. Box 20, Goulburn, N.S.W.

FOR SALE: Bendix LM12 Freq. Meter with original pwr. supply, as new, $90. Eddystone 504, 2 r.f., S meter, double xtal filter, $95. VK2JJ, 28 Highworth Ave., Bexley, N.S.W., 2207. Phone 50-7926.

FOR SALE: Geloso G209 Receiver, Q multiplier OF-1, preselector, 160 metre converter, $250 or offer. Wm. F. Sievers, 132 Orrong Rd., Toorak, Vic., 3142. Phone 24-4154.

GRID DIPPER wanted, commercial or good home made. Full particulars to Clem Schmidt, P.M.B. 3, Hampden, S.A., 5370.

SELL: Modified 522 Rx with E88CC front end, $10. Unmodified BC733 Rx, $8. Various large professionally made 19 in. Panel Cabinets, from $6. P/S 500v. at ½a., $8. (3) P/S's built onto back of 19 in. Cabinets, ideal for Test Equip., $8 ea. AR8 Rx front end, $3. (2) V.h.f. Panadaptor Rx's, incomplete, with 2 turret tuners, $6 ea. (1) Radar Unit minus display indicator in rack-cabinet 5 ft. x 4 ft. with sliding plug-in chassis units, unmodified, $15. (1) 7 ft. x 19 in. x 2 ft. professionally built Equip. Cabinet, door at rear, $14. Small Spy Rx, B/C— 15 Mc. with AC/DC p.s., $10. Plus many chassis with good parts, transformers, 813, 2E26, 327A, 4E27 and other tx tubes, meters, etc. Open to offers all units. VK3YA and VK3AVP, Tel. 729-1724, or Ferntree Gully 961 (Vic.).

SELL: Professionally bound gold embossed back issues "QST" to best offer single or preferably the lot: Jan.-June '62, July-Dec. '62, Jan.-June '63, July-Dec., '63, Jan.-June '65, July-Dec. '65, Jan.-June '66, July-Dec. '66, Jan.-June '67. Roth Jones, 1 Albert Rd., Melbourne, Vic., 3004.

WANTED: Commun. Receiver in A1 condition, for s.s.b. and c.w. Good bandspread, Ham bands. Details tuning range, sensitivity, selectivity, to VK6ZO, 3 Head St., Melville, W.A., 6156.

WANTED: Galaxy V. Transceiver with power supply and handbook. L. Schmidt, 2 Ward St., Ashburton, Vic., 3147. Phone 25-4678.

WANTED: Geloso V.f.o. 4/103 model (144 Mc.). Grip Dip Oscillator and Signal Generator. Price and particulars to VK4HH, 57 Somers St., Nudgee, Brisbane, Qld., 4014.

WANTED: Tri-Band Beam TH3, etc., in good condition. VK3WW, Phone 465-2991 (Vic.).

WANTED TO BUY: High power Modulation Transformer UM3 or similar, also 2 power transformers approx. 600 volt at 250 mA. each, for 6/40 rig and modulator. Contact Howard VK3ZVH at 325 Waverley Road, Mt. Waverley, or phone 277-1207 after 6 p.m.

WANTED TO BUY: Pre-1927 Radio Sets and parts, especially bright emitter and early tx valves, neutrodyne rx's. Also magazines (not Listener In) and A.R.R.L. Handbooks, pre-1934. F. K. McTaggart, VK3NW, 37 Ryeburne Ave., Hawthorn East, Vic., Phone 82-1141.

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- **TECH TO3 3" OSCILLOSCOPE**
  Specifications.—**Vertical Axis**: deflection sensitivity, 0.1v. p-p/cm.; freq. characteristics, 1.5 c/s. to 1.5 Mc.; input impedance, 2 megohms, 25 pF.; calibration voltage, 1v. p-p/cm. **Horizontal Axis**: deflection sensitivity, 0.9v. p-p/cm.; freq. characteristics, 1.5 c/s. to 800 Kc.; input impedance, 2 megohms, 20 pF. **Sweep Osc.**, 5 ranges: 10-100 c/s., 100 c/s.-1 Kc., 1 Kc.-10 Kc., 10-80 Kc., 50-300 Kc. **Synchronisation**: Internal (negative or positive), external, or line. Cathode ray tube, 3KP1F. **$136.00.**

- **TECH TE40 MILLIVOLTMETER**
  AC volts: 0.01, 0.03, 0.1, 0.3, 1.0, 3, 10, 30, 100, 300. Accuracy: 5 c/s. to 1.2 Mc. ± 2 db. (db. scale +2 to —25 db.); 10 c/s. to 1 Mc. ±1 db.; 20 c/s. to 250 Kc. ±0.2 db. db. scale: —40, —30, —20, —10, 0, +10, 20, 30, 40, 50 dbm. **$59.25.**

- **TECH TE65 V.T.V.M.**
  DC volts: 1.5, 5, 15, 50, 150, 500, 1500. AC volts: 1.5, 5, 15, 50, 150, 500, 1500v. r.m.s.; 1.4, 4, 14, 40, 140, 400, 1400, 4000v. p-p. Resistance: R × 10, 100, 1K, 10K, 100K, 1M, 10M. Decibel: —10 db. to +65 db. **£50.00.**

- **MILLER 8903B 455 Kc. PRE-WIRED I.F. STRIPS**
  Comprises two i.f. stages, diode detector, in-built a.v.c, 55 db. gain, NPN silicon transistors. DC requirements, 6 v.d.c. 2 mA. Size, 1½" x ½" x ½". **$8.70** inc. tax.

- **STAR SR700A AMATEUR-BAND RECEIVER**
  Freq. coverage: 80 mx, 3.4-4.0 Mc.; 40 mx, 7.0-7.6 Mc.; 20 mx, 14.0-14.6 Mc.; 15 mx, 21.0-21.6 Mc.; 10 mx (A), 28.0-28.6 Mc.; 10 mx (B), 28.6-29.1 Mc.; 10 mx (C), 29.1-29.7 Mc. Triple conversion: 1st i.f., 3.4-4.0 Mc.; 2nd i.f., 1650 Kc.; 3rd i.f., 55 Kc. Sensitivity: a.m. less than 1 uV. for 10 db S+N/Noise Ratio; c.w./s.s.b. less than 0.5 uV. for 10 db. S+N/Noise Ratio. Selectivity: 0.5 Kc., 1.2 Kc., 2.5 Kc., 4 Kc., all at —6 db. In-built 100 Kc. Crystal Calibrator (crystal supplied). **$461.50.**

WANTED TO BUY

Communication Receivers, Test Equipment, etc. Call, write or phone Equipment inspected and picked up at your convenience any night or week-end.

- **STAR ST700 SSB TRANSMITTER**
  250w. p.e.p. Employs high efficiency AB2 final. Incorporates vox, p.t.t., mechanical filter for max. suppression. Freq. coverage: 80 mx, 3.4-4.0 Mc.; 40 mx, 7.0-7.6 Mc.; 20 mx, 14.0-14.6 Mc.; 15 mx, 21.0-21.6 Mc.; 10 mx (A), 28.0-28.6 Mc.; 10 mx (B), 28.5-29.1 Mc.; 10 mx (C), 29.1-29.7 Mc. Emission: CW, LSB, USB, AM with carrier injection. In-built c.w. sidetone monitor. Clickless keying with unique tone osc. system (no keying of relays). **$519.20** inc. tax. Note: SR700A and ST700 couple together for complete transceive operation.

- **VALVE SOCKETS, P.T.F.E.**
  7-pin complete with can, **20c ea.**; 9-pin complete with can, **50c ea.** Ideal for 144 or 432 Converters or Tx's.

- **ELECTROLYTIC CONDENSERS**
  50 uF., 125v.w. pigtail type. Late manufacture. **20c ea.**

- **A111 9 Mc. SSB EXCITER**
  A fibre-glass printed circuit board, the finest German crystal filter, diode ring modulator, and solid state circuitry all contribute to make the A111 the finest SSB Exciter available. Specifications: Sideband suppression, 80 db.; carrier sup., 65 db.; audio freq. response, 350 to 3,000 cycles; mic. input, 1 mV. on 5K ohm load. Incorporates vox amplifier and relay amp. Price with KVG. **XF9B** Filter, **$240.**

- **A112 5 Mc. VFO**
  Freq. coverage: 4950 to 5550 Kc. Freq. stability better than 100 c/s. over 12 hrs. long term; better than 8 c/s. over 10 mins. if enclosed in suitable box. Output: 350 mV. on 220 ohm load. Price **$22.**

- **EICO 753 TRI-BAND SSB TRANSCEIVER KIT**
  180w. p.e.p. on SSB or CW, 80w. on AM. 5.2 Mc. crystal filter. Sideband sup., —40 db.; carrier sup., —50 db. Receiver sensitivity: 1.0 uV. for 10 db. signal to noise. Receiver selectivity, 2.7 Kc. at 6 db. 10 Kc. receiver off-set tuning. Printed circuit i.f. strip. Pre-aligned xtal filter. Freq. coverage: 80 mx, 3490-4010 Kc.; 40 mx, 6990-7310 Kc.; 20 mx, 13890-14410 Kc. (LSB 80 and 40 mx, USB 20 mx). Price **$328.78.**

- **PETERSEN RADIO PR100 CALIBRATORS**
  Comprising 1 transistor 100 Kc. crystal oscillator, 1 transistor emitter follower, fibre-glass printed circuit board, trimmer on crystal for zero beat with WWV. Crystal accuracy 0.005%. Power requirements, 15v.d.c. 14 mA. Price **$22** inc. tax and plus postage.

- **K109 SWR METERS**
  75 ohms or 52 ohms input and output. SWR 1 : 1 to 1 : 10 ±3%. 100 micro-amp. meter. **$18.50.**

- **CO-AXIAL CABLE**
  UR70, ¼" diam., 72 ohms, supplied with Belling Lee Connector. **27 yards $2.00.** Post and packing 75c.

- **RESISTORS**
  Wide range of values available in ¼ watt, ½ watt or 1 watt. Welwyn, I.R.C., Ducon, and Erie. **$2.00 per 100.**

- **CAPACITORS**
  Miniature 600v.w. pigtail type: 0.001, 0.005, 0.0002, 0.0005. Also Ceramic. **$2.00 per 80.**

- **POTENTIOMETERS**
  Wire-wound, 100 ohms to 100K ohms, 1 watt to 3 watt. **40c ea.** Carbon, 100 ohms to 5 megohms, **20c ea.**

- **VALVES**
  New Philips: QB/250 (813), $10; 815, $1; 807, $1.50; TZ40, $1.50; 416B, $4; VR150/30 and VR105/30, 75c ea. or 3 for $2; ECC33 (6SN7), 40c.; 6AM5, 50c; 6AC7, 20c or 12 for $2; 6K8, 75c or 3 for $2; 6J7, 40c or 6 for $2; 6J6, 50c or 5 for $2; EF50, 20c.

- **TELEMAX T75 FREQUENCY METER**
  85 to 1,000 Mc. Heterodyne type with 5 Mc. internal standard. VHF version of BC221. Immaculate condition. **$150.**

- **PANEL METERS, P25 TYPE**
  100 uA., $6.95; 500 uA., $5.25; 1 mA., $4.50; 10 mA., $4.50; 50 mA., $4.50; 100 mA., $4.50; VU meter, $6; S meter, $4.80.

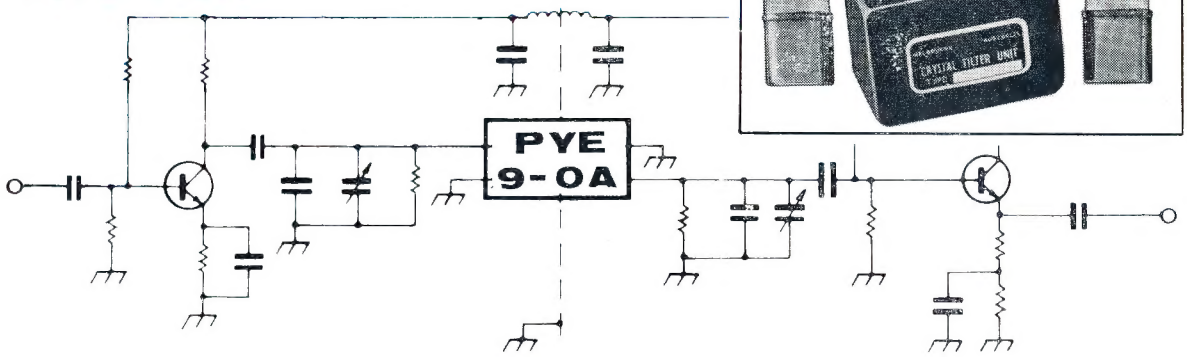
ALL ITEMS FREIGHT EXTRA

UNITED TRADE SALES PTY. LTD.

280 LONSDALE ST., MELBOURNE, VIC. (Opp. Myers) **Phone 32-3815**

9 Mc. SSB CRYSTAL FILTER

PYE TYPE 9-0A



The PYE 9 Mc. S.S.B. FILTER PACKAGE UNIT consists of:

- 1 PYE Type 9-0A Crystal Filter Unit.
- 1 PYE Type Q12A 9002 Kc. Crystal Unit.
- 1 PYE Type Q12A 8998 Kc. Crystal Unit.
- 2 PYE Type D Crystal Sockets.

Also Typical Schematic Circuit Diagram and Application Notes. The crystal frequencies represent the upper and lower sidebands.

NEW PRICE
$20.83
PLUS TAX
Write for details

SPECIFICATIONS 9-0A:

6.0 db. Bandwidth	3 Kc. min.
40 db. Bandwidth	6 Kc. max.
Pass Band Ripple	2 db. max.
Insertion Loss	4.5 db. max.
Input Termination	150 Ω plus 150 pF.
Output Termination	150 Ω plus 120 pF.
Physical Dimensions	2" x 1.375" x 1.125"

PYE PTY. LTD.
CRYSTAL DIVISION
Q.C.B. APPROVED ORGANISATION

CLARINDA ROAD, CLAYTON, VICTORIA
P.O. BOX 105, CLAYTON, VIC., 3168
Phone 544-0361 TELEGRAMS: "PYTRONIC" MELBOURNE

AUSTRALIAN MADE

DYNAMIC MICROPHONE & STAND

★ *LOW PROFILE* ★ *COMPACT* ★ *STABLE*

SPECIFICATIONS:

Impedance: 50 ohms, 50K ohms
Frequency Range: 80 to 12 Kc.
Output: —55 db. (0 db. = 1V./dyne Cm2)
Switch: D.P.D.T. P. to T.
Housing: Angle adjustable

ROBUST BASE STATION P.A. MICROPHONE

TYPE 45

ZEPHYR PRODUCTS PTY. LTD.

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